

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES**

In re Application of:	PHILYAW, Jeffry Jovan	
Application Serial No.:	09/602,034	Confirmation No.: 9028
Filing Date:	June 23, 2000	
Group:	2157	
Examiner:	JACOBS, LaShonda T.	
Title:	PHLY-25,337	

AMENDED BRIEF ON APPEAL

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APPELLANTS' AMENDED MAIN BRIEF ON APPEAL

This Brief is submitted in response to the Notification of Non-Compliant Appeal Brief received in response to the Appeal Brief submitted in accordance with 37 C.F.R. § 41.67 concerning the Notice of Appeal filed March 16, 2007, in response to the Final Office Action dated November 16, 2006, wherein the Examiner finally rejected claims 1, 5-6, 8-10, 14-15, 17-18, 21 and 22, and objected claims 3, 4, 7, 12, 13 and 16 that comprise all of the pending claims in this application.

I. Real Party Interest.

The party in interest is L.V. Partners, L.P., a Texas limited partnership, whose general partner is LV GP, L.L.C., and whose principal office and place of business is at 2626 Cole Avenue, Dallas, Texas 75204.

II. Related Appeals and Interferences.

Appellants have the following related-application pending appeals:

- U.S. Patent Application Serial No. 07/614,937, Appeal No. 2007-1745 entitled "LAUNCHING A WEB SITE USING A PASSIVE TRANSPONDER" (Atty. Dkt. No. PHLY-25,356), filed on July 11, 2000;

- U.S. Patent Application Serial No. 09/494,924 entitled “INPUT DEVICE FOR ALLOWING INTERFACE TO A WEB SITE IN ASSOCIATION WITH A UNIQUE INPUT CODE” (Atty. Dkt. No. PHL Y-24,913), filed on February 1, 2000;
- U.S. Patent Application Serial No. 09/382,374 entitled “METHOD AND APPARATUS FOR ALLOWING A BROADCAST TO REMOTELY CONTROL A COMPUTER” (Atty. Dkt. No. PHL Y-24,736), filed August 24, 1999;
- U.S. Patent Application Serial No. 09/417,863 entitled “SOFTWARE DOWNLOADING USING A TELEVISION BROADCAST CHANNEL” (Atty. Dkt. No. PHL Y-24,767), filed October 23, 1999; and
- U.S. Patent Application Serial No. 09/659,520 entitled “LAUNCHING A WEBSITE USING A PERSONAL DEVICE” (Atty. Dkt. No. PHL Y-25,355), filed September 12, 2000.

Appellants have filed Notices of Appeal in the following related applications:

- U.S. Patent Application Serial No. 09/382,423 entitled “METHOD AND APPARATUS FOR UTILIZING AN AUDIBLE SIGNAL TO INDUCE A USER TO SELECT AN E-COMMERCE FUNCTION” (Atty. Dkt. No. PHL Y-24,739), filed on August 24, 1999;
- U.S. Patent Application Serial No. 09/659,170 entitled “ACCESSING A VENDOR WEB SITE USING PERSONAL ACCOUNT INFORMATION RETRIEVED FROM A CREDIT CARD COMPANY WEB SITE” (Atty. Dkt. No. PHL Y-25,340), filed on September 11, 2000;
- U.S. Patent Application Serial No. 09/642,891 entitled “RETRIEVING PERSONAL ACCOUNT INFORMATION FROM A WEB SITE BY READING A CREDIT CARD” (Atty. Dkt. No. PHL Y-25,338), filed on August 21, 2000; and

- U.S. Patent Application Serial No. 09/382,426 entitled “METHOD AND APPARATUS FOR LINKING A WEB BROWSER TO A PROMOTION OFFER” (Atty. Dkt. No. PHLY-24,732), filed on August 24, 1999.

The above-identified patent application has no related interferences.

III. Status of the Claims.

Claims 1-18, 21 and 22 from the application are pending, stand firmly rejected, and are on appeal here. A complete and current listing of Claims 1-18, 21 and 22 are attached here in the **CLAIMS APPENDIX**.

IV. Status of Amendments.

Appellants filed an Amendment After Final on December 2, 2006 in response to the Final Office Action, mailed November 16, 2006 which was not entered, but which is attached hereto as **EXHIBIT F**. An amendment filed November 21, 2005 was the last Response entered.

V. Summary of the Claimed Subject Matter.

The current invention, as set forth in independent Claim 1, relates to a method for accessing information over a network from a remote location on the network for delivery to a user PC. The method comprises the step of providing a functional mode on a cellular telephone for web access over the network, the cellular telephone separate from the user PC and the functional mode having associated therewith a unique code. (See specification at reference number 2500 on Figure 25; page 46, lines 8-22; page 50, line 23 – page 51, line 4; reference 3020 on Figure 30; page 51, lines 12-15; and page 52, lines 1-6.) The method includes the step of associating at least a button on the cellular telephone with the functional mode. (See specification at reference number 2502 on Figure 25; page 44, lines 18-20; and page 46, lines 5-14.) The method includes the step of activating the button on the cellular telephone to activate the functional mode (see specification at page 46, lines 1-22; page 47, lines 26-27; and page 49, lines 8-9) when the user is in physical proximity to the user PC (see specification at page 44, line 20 – page 45, line 6; and page 52, lines 4-6) and, in response thereto, transferring to the user PC the unique code (see specification at page 44, lines 13-24; page 45, lines 20-23; and page 46, lines 1-5), which unique code has no routing code contained therein that would by itself uniquely

identify the location of the remote location on the network (see specification at page 45, lines 6-15; page 46, lines 22-27; and page 52, lines 8-24), but which unique code has a predetermined association with the remote location. (See specification at page 45, lines 10-25; and page 50, lines 8-12) The method further includes the step of, in response to activation of the functional mode, the user PC then utilizes the unique code received from the cellular telephone and the predetermined association thereof with the remote location to access information from the remote location on the network for delivery to the user PC and display thereof on a display associated with the user PC such that the user PC is controlled in accordance with the unique code to access the predetermined remote location. (See specification at page 45, lines 6-25; page 46, line 20 – page 47, line 11; page 48, lines 11-22; page 49, lines 10-27; page 50, lines 4-14; and page 52, lines 1-8)

The current invention, as set forth in dependent Claim 3, relates to the method of Claim 1, where the step of providing the functional mode comprises storing the unique code in the cellular telephone (see specification at page 44, lines 15-18; page 46, line 1; page 47, lines 12-27; page 48, line 25 – page 49, line 7; and page 51, lines 20-23), which unique code is associated in the step of associating with the button, such that the unique code is output as a function of activation of the button in the step of activating for delivery to the user PC in the step of controlling. (See specification at page 47, line 24-27; and page 48, lines 1-10)

The current invention, as set forth in dependent Claim 4, relates to the method of Claim 3, where the step of activating comprises transmitting the unique code to the user PC and the user PC further including the step of receiving the unique code from the cellular telephone and, in response thereto, accesses the information from the remote location on the network. (See specification at page 45, lines 6-25; and page 46, line 20 – page 47, line 11)

The current invention, as set forth in dependent Claim 5, relates to the method of Claim 4, where the step of transmitting comprises transmitting via a wireless mode. (See specification at page 44, lines 22-24; page 45, lines 1-6; page 48, lines 5-7; and page 51, lines 1-7 and lines 23-25)

The current invention, as set forth in dependent Claim 6, relates to the method of Claim 5, where the step of transmitting via the wireless mode includes transmitting via an optical link.

(See specification at page 44, lines 22-24; page 45, lines 5-6; page 48, lines 5-7; and page 51, lines 1-7 and 23-25)

The current invention, as set forth in dependent Claim 7, relates to the method of Claim 3, where the step of controlling the user PC further comprises the steps of receiving the unique code (see specification at page 45, lines 1-10; page 46, lines 20-22; page 48, lines 11-12; page 49, lines 10-12; and page 50, lines 3-7); transmitting the unique code to an intermediate node on the network (see specification at page 45, lines 6-10; page 49, lines 12-14; and page 50, lines 4-7); providing a relational database at the intermediate node on the network having contained therein a relational table between one or more unique codes and corresponding location information of the network (see specification at page 45, lines 10-15; page 46, lines 24-27; page 48, lines 12-17; page 49, lines 14-17; and page 50, lines 4-7); comparing the unique code transmitted to the intermediate node with location information that resides in the informational database and, if there is a match, transmitting the matched location information back to the user PC (see specification at page 45, lines 10-15; page 46, line 24 – page 47, line 6; page 49, lines 16-21; and page 50, lines 8-10); and connecting the user PC to the remote location in accordance with the matched location information returned thereto from the intermediate node. (See specification at page 45, lines 20-25; page 47, lines 6-10; page 48, lines 19-21; and page 49, lines 22-27)

The current invention as set forth in dependent Claim 8, relates to the method of Claim 4, where the step of transmitting comprises transmitting an audio signal wherein the step of receiving comprises receiving and detecting the audio signal and extracting the information in the unique code therefrom. (See specification at page 45, lines 1-5; and page 49, lines 8-12)

The current invention, as set forth in dependent Claim 9, relates to the method of Claim 1, where the network is a global communication network. (See specification at reference number 306 on Figure 3; and page 45, lines 10-15)

The current invention, as set forth in independent Claim 10, relates to an apparatus for accessing information over a network from a remote location on the network for delivery to a user PC. The apparatus includes a cellular telephone for providing a functional mode for web access over the network, the cellular telephone separate from the user PC, the functional mode

having associated therewith a unique code. (See specification at reference number 2500 on Figure 25; page 46, lines 8-22, page 50, line 23 – page 51, line 4; reference 3020 on Figure 30; page 51, lines 12-15; and page 52, lines 1-8) The apparatus further includes at least a button on the cellular telephone associated with said functional mode (see specification at reference number 2502 on Figure 25; page 44, lines 18-20; and page 46, lines 5-14), wherein the button on the cellular telephone is activated to initiate the functional mode (see specification at page 46, lines 1-22; page 47, lines 26-27; and page 49, lines 8-9) when the user is in physical proximity to the user PC (see specification at page 44, line 20 – page 45, line 6; and page 52, lines 4-6) and to transfer to the user PC the unique code (see specification at page 44, lines 13-24; page 45, lines 20-23; and page 46, lines 1-5), which unique code has no routing code contained therein that would by itself uniquely identify the location of the remote location on the network (see specification at page 45, lines 6-15; page 46, lines 22-27; and page 52, lines 8-24), but which unique code has a predetermined association with the remote location (see specification at page 45, lines 10-25; and page 50, lines 8-12); and where, in response to activation of the functional mode, the user PC utilizes the unique code received from this cellular telephone and the predetermined association thereof with the remote location to access information from the remote location on the network for delivery to the user PC and display thereof of the information on a display associated with the user PC; such that the user PC is controlled in accordance with the unique code to access said predetermined remote location. (See specification at page 45, lines 6-25; page 46, line 20 – page 47, line 11; page 48, lines 11-22; page 49, lines 10-27; page 50, lines 4-14; and page 52, lines 1-8.)

The current invention, as set forth in dependent Claim 11, relates to the apparatus of Claim 11, where the unique code is stored in the cellular telephone (See specification at page 44, lines 15-18; page 46, line 1; page 47, lines 12-27; page 48, line 25 – page 49, line 7; and page 51, lines 20-23), which the unique code is associated with the button, such that the unique code is output to the user PC as a function of activation of the button. (See specification at page 47, line 24-27; and page 48, lines 1-10.)

The current invention, as set forth in dependent Claim 13, relates to the apparatus of Claim 12, where the unique code is transmitted to the user PC, and the user PC the unique code is received from the cellular telephone and, in response thereto, the information from the remote

location on the network is accessed. (See specification at page 45, lines 6-25; page 46, line 20 – page 47, line 11; page 48, lines 11-22; and page 49, lines 8-21.)

The current invention, as set forth in dependent Claim 14, relates to the apparatus of Claim 13, where the unique code is transmitted via a wireless mode. (See specification at page 44, lines 22-24; page 45, lines 1-6; page 48, lines 5-7; and page 51, lines 1-7 and lines 23-25.)

The current invention, as set forth in dependent Claim 15, relates to the apparatus of Claim 14, where the unique code is transmitted via an optical link. (See specification at page 44, lines 22-24; page 45, lines 5-6; page 48, lines 5-7; and page 51, lines 1-7 and 23-25.)

The current invention, as set forth in dependent Claim 16, relates to the apparatus of Claim 12, where the user PC is controlled to receive the unique code, and to transmit the unique code to an information system on the network. (See specification at page 45, lines 1-10; page 46, lines 20-22; page 48, lines 11-12; page 49, lines 10-12; and page 50, lines 3-7.) The information system on the network comprises an intermediate node which receives the unique code (See specification at page 45, lines 6-10; page 49, lines 12-14; and page 50, lines 4-7); and a relational database at the intermediate node having contained therein a relational table between one or more of the unique codes and corresponding location information of the network. (See specification at page 45, lines 10-15; page 46, lines 24-27; page 48, lines 12-17; page 49, lines 14-17; and page 50, lines 4-7.) The unique code which is transmitted to the intermediate node is compared with the location information that resides in the relational database. If there is a match, the matched location information is transmitted back to the user PC. (See specification at page 45, lines 10-15; page 46, line 24 – page 47, line 6; page 49, lines 16-21; and page 50, lines 8-10.) The user PC is connected to the remote location in accordance with the matched location information returned thereto from the intermediate node. (See specification at page 45, lines 20-25; page 47, lines 6-10; page 48, lines 19-21; and page 49, lines 22-27.)

The current invention, as set forth in dependent Claim 17, relates to the apparatus of Claim 13, where an audio signal is transmitted to the user PC, which user PC receives and detects the audio signal, and extracts the unique code therefrom. (See specification at page 45, lines 1-5; and page 49, lines 8-12.)

The current invention, as set forth in dependent Claim 18, relates to the apparatus of Claim 10, where the network is a global communication network. (See specification at reference number 306 on Figure 3; and page 45, lines 10-15.)

The current invention, as set forth in dependent Claim 21, relates to the method of claim 1, where the cellular telephone has a communication mode to allow voice communication where the cellular telephone communicates via a cellular telephone network and the step of transferring to the user PC the unique code occurs over a separate communication link between the user PC and the cellular telephone. (See specification at page 45, lines 6-10; page 46, lines 15-19; page 48, lines 5-7; page 50, line 23 – page 51, line 2; page 51, lines 5-25; and page 52, lines 1-6.)

The current invention, as set forth in dependent Claim 22, relates to the apparatus of claim 10, where the cellular telephone has a communication mode to allow voice communication where the cellular telephone communicates via a cellular telephone network and the cellular telephone is operable to transfer to the user PC the unique code over a separate communication link between the user PC and the cellular telephone. (See specification at page 45, lines 6-10; page 46, lines 15-19; page 48, lines 5-7; page 50, line 23 – page 51, line 2; page 51, lines 5-25; and page 52, lines 1-6.)

VI. Grounds of Rejection to be Reviewed on Appeal.

Claims 1, 5-10, 14-18 and 21-22 stand rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,519,463 to Tendler (“*Tendler*”).

As detailed below, Appellants believe that the Examiner has improperly applied the *Tendler* reference to claims 1, 5-10, 14-18 and 21-22. Specifically, Applicants submit that the §102 rejection based on this reference is not proper and is without basis, and that the Examiner has failed to state a *prima facie* case as to how *Tendler* anticipates under 35 U.S.C. § 102(e).

VII. Argument and Discussion.

In order to prevail, Appellant must show that Examiner has improperly applied *Tendler* in support of the 35 U.S.C. § 102(e). As such, a brief discussion of the relevant rules and recent court decisions affecting the finding of a proper rejection under 35 U.S.C. § 102(e) follows.

A. Rejections under 35 U.S.C. §102(e)

MPEP §2131 specifies that:

“A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.” *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). “When a claim covers several structures or compositions, either generically or as alternatives, the claim is deemed anticipated if any of the structures or compositions within the scope of the claim is known in the prior art.” *Brown v. 3M*, 265 F.3d 1349, 1351, 60 USPQ2d 1375, 1376 (Fed. Cir. 2001) (claim to a system for setting a computer clock to an offset time to address the Year 2000 (Y2K) problem, applicable to records with year date data in “at least one of two-digit, three-digit, or four-digit” representations, was held anticipated by a system that offsets year dates in only two-digit formats). See also MPEP § 2131.02. “The identical invention must be shown in as complete detail as is contained in the ... claim.” *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989). The elements must be arranged as required by the claim, but this is not an *ipsissimis verbis* test, i.e., identity of terminology is not required. *In re Bond*, 910 F.2d 831, 15 USPQ2d 1566 (Fed. Cir. 1990). Note that, in some circumstances, it is permissible to use multiple references in a 35 U.S.C. 102 rejection. See MPEP § 2131.01.

Under 35 U.S.C. § 102(e), MPEP §2131.01, the Examiner may combine another reference, which further explains that:

Normally, only one reference should be used in making a rejection under 35 U.S.C. 102. However, a 35 U.S.C. 102 rejection over multiple references has been held to be proper when the extra references are cited to:

- (A) Prove the primary reference contains an “enabled disclosure;”
- (B) Explain the meaning of a term used in the primary reference;
or
- (C) Show that a characteristic not disclosed in the reference is inherent.

In order to meet the second criterion for introducing additional references, MPEP §2131.01 II specifies that:

Extrinsic evidence may be used to explain but not expand the meaning of terms and phrases used in the reference relied upon as anticipatory of the claimed subject matter.

In order to meet the third criterion for introducing additional references, MPEP §2131.01 III specifies that

“To serve as an anticipation when the reference is silent about the asserted inherent characteristic, such gap in the reference may be filled with recourse to extrinsic evidence. Such evidence must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill.” *Continental Can Co. USA v. Monsanto Co.*, 948 F.2d 1264, 1268, 20 USPQ2d 1746, 1749 (Fed.Cir. 1991)

In the present application, the reference provided by the Examiner does not describe each and every element of the claims of the instant application, expressly or inherently. This means that the Examiner has failed to provide a single prior art reference that anticipates Appellants present inventive concept as defined by the claims.

B. Decisions Regarding a Finding of Anticipation.

With respect to anticipation, a claimed invention is unpatentable if the differences between it and the prior art are such that “one skilled in the art would reasonably understand or infer from the prior art reference's teaching that every claim [limitation] was disclosed in that single reference.”¹ Determining whether a prior art reference discloses each and every limitation of the claim, expressly or inherently, is a factual question reviewed for substantial evidence. This factual question is contingent upon the proper claim construction.”²

Proper claim construction begins with an interpretation of the meaning of the claim language. To ascertain the meaning of claims, the court considers three sources: the claims, the

¹ *Akamai Technologies, Inc v. Cable & Wireless Internet Services, Inc.*, 344 F.3d 1186, 1192 (Fed. Cir. 2003) (citing *Dayco Prods., Inc. v. Total Containment, Inc.*, 329 F.3d 1358, 1368 (Fed. Cir. 2003))

² *Id.*

specification, and the prosecution history, as well as extrinsic evidence.³ In *Lacks Industries, Inc. v. McKechnie Vehicle Components USA, Inc.*, 322 F.3d 1335 (Fed. Cir. 2003) the Court noted that, in regards to claim construction:

“... we begin with an examination of the intrinsic evidence, *i.e.*, the claims, the other portions of the specification, and the prosecution history (if in evidence). *Gart v. Logitech, Inc.*, 254 F.3d 1334, 1339, 59 USPQ2d 1290, 1293-94 (Fed. Cir. 2001). Courts may also review extrinsic evidence in construing a claim. *E.g., Spectrum Int'l, Inc. v. Sterilite Corp.*, 164 F.3d 1372, 1378, 49 USPQ2d 1065, 1068 (Fed. Cir. 1998). Additionally, dictionary definitions, although extrinsic, may be used to establish a claim term's ordinary meaning. *Vitronics Corp. v. Conception, Inc.*, 90 F.3d 1576, 1584 n.6, 39 USPQ2d 1573, 1580 n.6 (Fed. Cir. 1996).”⁴

The court determines if an inventor imparted a novel meaning to the term.⁵ As such, the claims are read in light of the specification.⁶ *Vitronics* further states:

“the specification acts as a dictionary when it expressly defines terms used in the claims or when it defines terms by implication. As we have repeatedly stated, “claims must be read in view of the specification, of which they are a part.” The specification contains a written description of the invention which must be clear and complete enough to enable those of ordinary skill in the art to make and use it. Thus, the specification is always relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of the disputed term.”⁷

However, during examination, it is well recognized that “the patent application claims may be given their broadest interpretation consistent with the specification, in order to facilitate sharpening and clarifying the claims at the application stage.”⁸ Thus the patent examiner and the

³ *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 979 (Fed. Cir. 1995)

⁴ *Lacks Industries, Inc. v. McKechnie Vehicle Components USA, Inc.*, 322 F.3d 1335, 1341 (Fed. Cir. 2003)

⁵ See generally, *Omega Eng'g v. Raytek Corp.*, 334 F.3d 1314, 1323 (Fed. Cir. 2003)

⁶ *Vitronics Corp. v. Conception, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996)

⁷ *Id.*

⁸ *In re Yamamoto*, 740 F.2d 1569, 1571 (Fed. Cir. 1984) (“The PTO broadly interprets claims during examination of a patent application since the applicant may ‘amend his claims to obtain protection commensurate with his actual contribution to the art.’”)

applicant, in the give and take of rejection and response, work toward defining the metes and bounds of the invention to be patented.⁹ *Zletz* further states:

“An essential purpose of patent examination is to fashion claims that are precise, clear, correct, and unambiguous. Only in this way can uncertainties of claim scope be removed, as much as possible, during the administrative process.”¹⁰

Therefore, absent evidence that a “patentee unequivocally imparted a novel meaning to [the] term[] or expressly relinquished claim scope during prosecution,” we give the limitation its full ordinary and customary meaning.” Dictionary definitions provide evidence of a claim term’s “ordinary meaning.”¹¹ Regardless of the method of construction, the construction must be consistent with the language of the claims.¹²

Once the express limitations are construed, the next step is to construe the claims for any inherent limitation. A claim limitation is inherent in the prior art if it is necessarily present in the prior art, not merely probably or possibly present.¹³ Anticipation may be established if a missing claim element, although not explicitly present in the reference, is necessarily inherent in it.¹⁴ Under the principles of inherency, if the prior art necessarily functions in accordance with, or includes, the claimed limitations, it anticipates.¹⁵ Inherency is not necessarily coterminous with the knowledge of those of ordinary skill in the art. Artisans of ordinary skill may not recognize the inherent characteristic or functioning of the prior art.¹⁶ The mere fact that a certain thing may result from a given set of circumstances is not sufficient. If, however, the disclosure is sufficient to show that the natural result flowing from the operation as taught would result in the performance of the questioned function, it seems to be well settled that the disclosure should be regarded as sufficient. However, a gap in a reference may be filled with recourse to extrinsic evidence.¹⁷ However, if extrinsic evidence is offered, the extrinsic evidence “must make clear

⁹ *In re Zletz*, 893 F.2d 319, 321-22 (Fed. Cir. 1989)

¹⁰ *Id.* at 322

¹¹ *Abbott Laboratories v. Syntrol Bioresearch, Inc.*, 334 F.3d 1343, 1350 (Fed. Cir. 2003)

¹² *Lacks Industries, Inc. v. McKechnie Vehicle Components USA, Inc.*, 322 F.3d 1335, 1343 (Fed. Cir. 2003)

¹³ *Rosco v. Mirror Lite*, 304 F.3d 1373, 1380 (Fed. Cir. 2002).

¹⁴ See *Atlas Powder Co. v. Ireco Inc.*, 190 F.3d 1342, 1347 (Fed. Cir. 1999).

¹⁵ *Id.*

¹⁶ *Mehl/Biophile Int'l Corp. v. Milgraum*, 192 F.3d 1362, (Fed. Cir. 1999).

¹⁷ *Continental Can Co. USA, Inc. v. Monsanto Co.*, 948 F.2d 1264, 1267-68 (Fed. Cir. 1991).

that the missing descriptive matter is necessarily present" in the asserted anticipatory reference."¹⁸

Anticipation is established if every element of a properly construed claim is present in a single prior art reference. There must be no difference between the claimed invention and the reference disclosure, as viewed by a person of ordinary skill in the field of the invention.¹⁹ Therefore, a rejection for anticipation under § 102 requires that each and every limitation of the claimed invention be disclosed in a single prior art reference.²⁰

C. 35 U.S.C § 102 Rejection in the Application on Appeal.

The Examiner maintains the 35 U.S.C. § 102(e) rejection of claims 1, 5-10, 14-18 and 21-22 as being anticipated by *Tendler*.²¹ Additionally, the Examiner maintains the objection to Claims 3-4, 7, 12-13 and 16 as being dependent upon a rejected claim, but allowable if rewritten in independent form, including all of the limitations of the base claim and any intervening claims.²²

Appellants submit that the Examiner has simply construed Appellants invention in a manner inconsistent with the claims and with the specification to support an anticipation rejection under 35 U.S.C. § 102. In order to establish a *prima facie* case of anticipation using *Tendler*, the Examiner must first show that the reference describes each and every element, expressly or inherently, to support a conclusion of anticipation as it relates to the entire invention. The Examiner may then provide secondary references to illustrate that the primary reference describes a gap, or inherency, in the express limitations. Appellants submit that the Examiner's use of *Tendler* is conclusory, and that no description or teaching in *Tendler* to support the rejection has been provided.

¹⁸ *Id.*

¹⁹ *Biacore v. Thermo Bioanalysis Corp.*, 79 F. Supp. 2d 422, 459 (D. Del. 1999)

²⁰ *In re Paulsen*, 30 F.3d 1475, 1478-79 (Fed. Cir. 1994)

²¹ See Final Office Action mailed November 16, 2006 on pages 3-5

²² See Final Office Action mailed November 16, 2006 on page 7

1. Independent Claim 1 as rejected by *Tendler*.

In the Final Office Action mailed November 16, 2006, the Examiner maintains her 35 U.S.C. § 102 rejection of Claims 1-18, 21 and 22 and her objection of Claims 3-4, 7, 12-13 and 16. On page 2 of the Final Office Action the Examiner states:

As per claims 1 and 10, *Tendler* discloses to a user PC, comprising the steps of: a method and apparatus for accessing information over a network from a remote location on the network for delivery

providing a functional mode on a cellular telephone for web access over the network, the cellular telephone separate from the user PC and the functional mode having associated therewith a unique code (col. 4, lines 6-27);

associating a button on the cellular phone with the functional mode (col. 5, lines 6-13);

activating the button on the cellular phone to activate the functional mode when the user is in physical proximity to the user PC, in response thereto, transferring to the user PC the unique code, which unique information has no routing code contained therein that would by itself uniquely identify the location of the remote location on the network, but which unique code has a predetermined association with the remote location (col. 5, lines 44-54);

in response to activation of the functional mode, the user PC then utilizes the unique code received from the cellular telephone and the predetermined association thereof with the remote location to access information from the remote location on the network for delivery to user PC and display thereof on a display associated with the user PC; such that the user PC is controlled in accordance with the unique code to access the predetermined remote location (col. 5, lines 55-65).²³

As such, the Examiner is stating that *Tendler* discloses each and every element of Claims 1 and 10 of the instant application.

2. The Cited References.

In the Response dated November 21, 2005, to the Office Action dated May 20, 2005, the arguments thereof repeated herein, Appellants question whether *Tendler* anticipates or obviates Appellants invention as set forth in the presented claims.

²³ See Final Office Action dated May 18, 2006 at page 2,

a. Discussion of U.S. Patent No. 6,519,463 to Tendler.

The only reference cited by the Examiner is *Tendler*. The primary purpose of *Tendler* is to provide a cost effective means of providing roadside or other services by informing central dispatch offices of the location of a vehicle through the utilization of a wireless phone having an associated GPS receiver, antenna, and voice synthesis capability for transmitting not only the identity of the vehicle, but also the location of the vehicle in English or other spoken language.²⁴ Specifically, *Tendler* provides a means for a user to obtain emergency assistance or information about vendor services while traveling in unfamiliar territory.²⁵

Tendler teaches a system utilizing a GPS enabled cellular telephone.²⁶ The cellular telephone can contain a large number of speed dial numbers.²⁷ When a particular button is activated, the phone will dial a predetermined number via the cellular network.²⁸ The cellular telephone contains a GPS engine, a speech and dialer board, and a number of service request buttons.²⁹ The phone also contains RF circuitry and audio/digital circuitry for the provision of cellular phone calls. A speech synthesizer in the cellular phone provides the ability to convey the service request via an audio line through the RF circuitry in order to provide a verbal rendition of the location of the phone.³⁰ Additionally, the cellular telephone contains an E²ROM to store pre-programmed phone numbers and other data.³¹

Tendler teaches that the user, while driving or walking, uses the cellular phone based service.³² The cellular telephone transmits the identity of the caller along with information identifying the location of the caller.³³ Depressing a service request button on the cellular telephone activates the cellular telephone to transmit information indicating that there is a service request as well as the identity and location information of the caller.³⁴ The cellular telephone transmits the request information, identity information and location information to a central

²⁴ See *Tendler*, Col. 1, lines 44-51.

²⁵ See *Tendler*, Col 1, lines 64-67; Col. 2, lines 1-9; Col. 6, lines 12-23.

²⁶ See *Tendler*, Col. 4, lines 50-55.

²⁷ See *Tendler*, Col. 6, lines 49-53.

²⁸ See *Tendler*, Col. 4, lines 12-19.

²⁹ See *Tendler*, Col 6, lines 23-35.

³⁰ See *Tendler*, Col. 3, lines 20-27; and Col 6, lines 41-54.

³¹ See *Tendler*, Col. 6, lines 48-55.

³² See *Tendler*, Col. 2, lines 19-24; lines 63-67; Col 3, lines 4-20; and lines 57-67.

³³ See *Tendler*, Col. 1, lines 45-50.

³⁴ See *Tendler*, Col. 5, lines 14-21.

dispatch center.³⁵ The central office, i.e., the dispatch center (50), is operable to receive the service request which provides the position of the cellular phone that placed the service request, possibly a vehicle identification number, and the cellular phone number of the cellular phone initiating the call.³⁶ Upon receipt of the cellular call, the dispatch center either manually or automatically enters the service request, latitude and longitude of the user and location of the user into a CPU at the dispatch center.³⁷ The operator at the dispatch center uses the CPU to access a database. The database contains the location of the particular service provider, the services rendered by the service provider, and, optionally, availability of the service provider, and other useful information regarding the service provider.³⁸ Thereafter, the *Tendler* system uses the location information provided by the caller and the service provider information provided in the database to identify and select the closest provider to the caller. The system can also, optionally, connect the caller, by phone, to the service provider.³⁹ Finally, the system uses the cellular number, the vehicle identification number, or both if provided by the caller, in order to charge the caller for the cellular service-based request.⁴⁰ The system can also contain medical information in the database such that, when the caller information is provided, the system is operable to dispatch emergency services if required.⁴¹

The Examiner maintains the 35 U.S.C. § 102(e) rejection that *Tendler* anticipates Claim 1 of the instant application.⁴² Independent Claim 1 of the instant application, as currently presented, is directed to a method for accessing information over a network from a remote location on the network for delivery to a user PC. The first step is to provide a functional mode on a cellular telephone for web access over the network. The claim requires that the cellular telephone is separate from the user PC. The claim also requires that the functional mode is associated with a unique code. *Tendler* does disclose a cellular phone with a functional mode. However, the functional mode on the cellular phone in *Tendler* is not for web access over the network from a remote location on the network for delivery to a user PC. *Tendler* teaches that

³⁵ See *Tendler*, Col. 5, lines 15-25.

³⁶ See *Tendler*, Col. 5, lines 32-37.

³⁷ See *Tendler*, Col. 5, lines 43-49; reference number 66 on Figure 1.

³⁸ See *Tendler*, Col. 5, lines 44-54.

³⁹ See *Tendler*, Col. 5, lines 55-65.

⁴⁰ See *Tendler*, Col. 6, lines 1-5.

⁴¹ See *Tendler*, Col. 6, lines 12-23.

⁴² See Final Office Action, mailed November 16, 2006, paragraph 6 on page 3.

the service request button, i.e. functional mode, dials a pre-determined telephone number in order to connect to a central dispatch center. The central dispatch center uses a CPU located at the central dispatch to access a database of service providers. The relevant section of *Tendler* is:

The result of the depression of any one of the service-request buttons is the activation of the cellular phone to dial the predetermined number and to transmit the requisite information either verbally or digitally that there is a service request, the vehicle number, the latitude and longitude of the cell phone as sensed by the GPS receiver, along with the cellular phone number for both billing and call-back purposes.

It will be appreciated that once having established contact with a central office dispatch center, not only is the particular service request known, but operators at the dispatch center can talk directly with the requesting individual.

In order for this to be accomplished, *a dispatch center generally indicated by reference character 50* includes a telephone 52 coupled to a local exchange 54 which is in turn coupled to a cell site 56 by a land line 58, such that the location of the cell phone is made known to the central office dispatch center.⁴³

Upon receipt of a call, the operator types in the service request, the latitude and longitude, and, optionally, the vehicle identification number and cell phone number at a keypad 60 which encodes the service request at 62 and the position at 64, *the indicated data being coupled to a CPU 66 which accesses a database 68*. The database has incorporated therein the location of the particular service provider, the services rendered by the service provider, the rates for the service, and any other information useful in the provision of the service.

Since the database 68 contains the location of the service provider, this is correlated with the position of the cellular phone as generated at 64, with a unit 70 selecting the closest service provider for the particular service requested. The option then is to switch the call from the cellular phone directly to the service provider via switch 72 so that the caller of the services may be directly patched to the service provider. Alternatively, the central office dispatch center may be interfaced with the service provider

⁴³ See *Tendler* at Col. 5, lines 14-32.

directly such that the dispatch center places a call at 74 to the particular service provider.⁴⁴ (*emphasis added*)

Tendler contains no disclosure regarding a user PC or that any connection is made to access the web. The *Tendler* cellular phone calls the dispatch center to access a database at the dispatch center. This is illustrated clearly in Figure 1, wherein *Tendler* identifies the CPU (66) and database (68) within the dispatch center (50) connected to a local telephone exchange (54) in order to receive a call from the cellular phone. Appellants stated previously, “[there] is no user PC disclosed in *Tendler* nor is there any way to allow the central location to which the phone is directed to access information for transmission to that location (that of the central location); rather, this system is merely one to connect the user via the phone to a requested service and not one to connect the user PC to the requested service.”⁴⁵

However, the Examiner is using the CPU (66) of the dispatch center (50) to provide the teaching of a user PC.⁴⁶ Previously the Examiner relied upon the CPU (66) of the dispatch center (50) as the remote location wherein the Examiner stated:

(a)-(b), Tendler discloses users of wireless phones to receive information regarding physical location of different places that accommodates the user. The user is able to press a button on his/her cell phone and receive the information regarding the location being accessed. Once the user presses the button the information is *transferred to a remote location (computer)* and the results are sent to user wireless phone. (*sic*) Therefore, Tendler explicitly discloses providing code to a user PC, which code would have no routing information contained therein, i.e., in and of itself it would not identify the remote location absent some association with the network and the user PC is in physical proximity to the cellular phone (col. 4, lines 6-27 and col. 5, lines 44-54).⁴⁷ (*emphasis added*)

Clearly, *Tendler* cannot support such an interpretation. *Tendler*’s dispatch center (50) and CPU (66) are not owned, operated, or controlled by the user. Specifically, *Tendler* teaches that the user operates the cellular phone and a dispatch operator at the dispatch center (50) controls the CPU (66). As such, *Tendler* teaches a user cellular phone and a system (dispatch)

⁴⁴ See *Tendler* at Col. 5, lines 44-65.

⁴⁵ See Response to Office Action dated May 30, 2004 at page 7.

⁴⁶ See Final Office Action mailed November 16, 2006, paragraph 6, page 4.

⁴⁷ See Office Action mailed February 2, 2004 at page 7.

PC. Even if the dispatch center were construed to be the remote location, then *Tendler* would be teaching transferring information directly from the cellular phone to the remote location, without a user PC. As such, both interpretations are inconsistent with the claim language.

Further, *Tendler* does not teach that the functional mode has an associated unique code. The Examiner agrees as much stating “Claims 2-4 and 11-13 are objected to as being dependent upon a rejected base claim, but would be allowable if re-written in independent form including all of the limitations of the base claim and any intervening claim.”⁴⁸ At the time of this objection, Claim 2 read as follows:

The method of Claim 1, *wherein the functional mode has associated therewith a unique code* that comprises the unique information, which unique code is associated with the remote location, such that the user PC is controlled in accordance with the unique code to access the predetermined remote location.⁴⁹
(emphasis added)

The Examiner now cites *Tendler* to teach associating a unique code with the functional mode.⁵⁰ The relevant portion of *Tendler* states:

In summary, a wireless phone based system is provided to accommodate users of phones for transmitting information as to the location of certain services such as gasoline stations, movie theatres, drug stores, etc., in which the phone includes a GPS receiver with the phone adapted to call a predetermined number requesting the desired service and providing the location of the phone. In one embodiment for vehicle applications, the GPS receiver is co-located with the phone, with the phone being carried in a handsfree cradle having *a number of service-request buttons, such that depression of a service-request button activates the phone through its bus structure to call a predetermined number and provide the identity of the caller along with the caller's location.* In a further embodiment, a single button is utilized to cause the phone to dial a concierge service, in which concierge service has operators and a database, such that the operator to direct the caller to whatever service the caller desires having been apprised of the location of the phone, this to allow the operator (*sic*) can key in the latitude and longitude of the phone and access

⁴⁸ See Office Action mailed February 27, 2006, paragraph 7, page 6.

⁴⁹ See Dependent Claim 2 as written in the Response to Office Action mailed November 21, 2005, In the Claims, on page 2.

⁵⁰ See Final Office Action, mailed November 16, 2006, paragraph 6, page 4.

the database of services both as to the type of service and as to the location of the closest service provider.⁵¹ (*emphasis added*)

Tendler contains no disclosure that the service-request button is associated with a unique code. The service request button of *Tendler* dials a predetermined phone number. This predetermined number cannot be construed to be a unique code associated with the functional mode.

However, if this predetermined phone number is considered to be a unique code associated with the functional mode, which Appellants contend it is not, this predetermined phone number fails to teach transferring to the user PC the unique code as required by the later step of Claim 1 of the instant application, which provides “activating the button on the cellular telephone to activate the functional mode when the user is in physical proximity to the user PC and, in response thereto, *transferring* to the user PC the unique code.” *Tendler* teaches that the cellular phone dials the predetermined number and transmits a service request and location of the cellular phone. The relevant portion of *Tendler* states:

The result of the depression of any one of the service-request buttons is the activation of the cellular phone to dial the predetermined number and to *transmit the requisite information either verbally or digitally that there is a service request, the vehicle number, the latitude and longitude of the cell phone as sensed by the GPS receiver, along with the cellular phone number for both billing and call-back purposes.*⁵² (*emphasis added*)

Clearly, the predetermined number is not transmitted; it is only dialed in order to connect with the dispatch center. The *Tendler* cellular phone transmits a service request, vehicle number, location of the cellular phone, and cellular phone number. Previously, Appellants stated, “[the] information that is transmitted from *Tendler* to a central location such as an operator’s desk is latitude and longitude. This latitude and longitude has no relationship to any location on a network. The other information that the user sends is a requested service. This button has no relationship to a particular service.”⁵³

⁵¹ See *Tendler* Col 4, lines 6-27

⁵² See *Tendler* Col. 5, lines 14-21.

⁵³ See Response to Office Action dated May 30, 2004 at page 7.

Further in this step, Independent Claim 1 of the instant application requires activating the button on the cellular telephone to activate the functional mode when the user is in physical proximity to the user PC and, in response thereto, transferring to the user PC the unique code. The claim further requires that the unique code contain no routing code that would, by itself, uniquely identify the location of the remote location on the network. The claim also requires that the unique code has a predetermined association with the remote location.

Therefore, even if the CPU (66) or dispatch center (50) are considered the user PC, which Appellants contend they are not, *Tendler* does not teach that the user is in *physical proximity* to the user PC. In prior responses, Appellants clearly illustrated that *Tendler* does not disclose the user being in physical proximity to the user PC. Appellants stated “[there] is no user PC that is in physical proximity to the cellular telephone but, rather, the user must transfer [the information] over a cell link to the remote PC, as this is on a cell site. Clearly, the dispatcher (50) is at a remote location.”⁵⁴ *Tendler* teaches that the cellular phone contains a GPS receiver. The *Tendler* cellular phone transmits the GPS data, i.e., the cellular location in latitude and longitude of the cellular telephone, to the dispatch center via a cell tower to a local exchange, i.e. over the telephone lines; such the dispatch is informed of the cellular phone location. As such, *Tendler* teaches that the cellular phone and the dispatch center are not located in physical proximity to each other. *Tendler* does not describe that the center and cellular phone would be located in physical proximity to each other.

Additionally, *Tendler* contains no disclosure that that the unique code has no routing information code contained therein that would, by itself, uniquely identify the location of the remote location on the network, but which unique code has a predetermined association with the remote location. The Examiner cites *Tendler*, column 5, lines 44-54 to provide this teaching. The specific portion of *Tendler* reads:

Upon receipt of a call, the *operator types in the service request, the latitude and longitude, and, optionally, the vehicle identification number and cell phone number* at a keypad 60 which encodes the service request at 62 and the position at 64, the indicated data being coupled to a CPU 66 which accesses a database 68. The database has incorporated therein the location of

⁵⁴ See Response to Office Action dated November 21, 2005 at page 9.

the particular service provider, the services rendered by the service provider, the rates for the service, and any other information useful in the provision of the service.⁵⁵

Clearly, the only codes disclosed in *Tendler* are the latitude and longitude, and, optionally, the vehicle identification number and cell phone number. First, none of these codes is a *unique code associated with the functional mode* as required by Independent Claim 1. The latitude and longitude are unique to a location. This code varies as the user changes location. Thus, the latitude and longitude are not associated with the functional mode. The vehicle identification number may be associated to the vehicle, but *Tendler* does not teach that this vehicle identification number would be associated to the functional mode. Additionally, the phone number is a number assigned to the cellular phone account. This is also not a unique code associated to the functional mode. With regard to each code, the functional mode merely transmits this information to the dispatch center.

Secondly, as Appellants stated “There is no disclosure of any ID, such as the user ID or vehicle ID, that is sent to the dispatcher for the purpose of looking up in a data base a remote location on the Web wherein there is an “association” of that transmitted information to the remote location on the network.”⁵⁶ The latitude and longitude are GPS information that the dispatcher uses to find service providers in close proximity to the user’s location. The GPS information does not have a predetermined association with a remote location on the network. *Tendler* teaches:

Since database 68 contains the *location of the service provider, this is correlated with the position of the cellular phone* as generated at 64, with a unit 70 selecting the closest provider for the particular service requested.⁵⁷ (*emphasis added*)

This is a physical location, or address, of the service provider. This is not a *remote location on the network*. Further, the vehicle identification number and phone number do not have a predetermined association with a remote location on the network. Both the vehicle identification number and phone number are used to identify the caller for billing and call back purposes. The relevant portion of *Tendler* teaches:

⁵⁵ See *Tendler* at Col. 5, lines 44-54.

⁵⁶ See Response to Office Action dated November 21, 2005 at page 9.

⁵⁷ See *Tendler* Col. 5, lines 55-58.

Because the cellular phone number or the vehicle identification number or both are provided to the central dispatch office, charges for the cellular based service request may be invoiced to the caller.⁵⁸

Tendler contains no disclosure that any information or code is used to identify a remote location on the network. The information transmitted by the phone identifies the type of service request, the location of the user, and the account of the user. Activation of the functional mode, i.e., service-request button, only *dials* the predetermined number. However, none of this information, or predetermined number, is associated with the functional mode *and* has a predetermined association with a location on a network as required by Independent Claim 1 of the instant application.

Furthermore, the next step of Independent Claim 1 of the instant application, requires that, in response to activation of the functional mode, the user PC then utilizes the unique code received from the cellular phone and the predetermined association thereof with the remote location to access information from the remote location on the network for delivery to the user PC and display thereof on a display associated with the user PC. Appellants stated “[even] if a combination of the latitude and longitude and the requested service is associated uniquely with a remote location on the network, there is nothing to cause information from the network to be transmitted to the user PC and then displayed to the user.”⁵⁹ *Tendler* teaches that the user is connected to the service provider via the phone connection. The relevant portion of *Tendler* states:

Since the database 68 contains the location of the service provider, this is correlated with the position of the cellular phone as generated at 64, with a unit 70 selecting the closest service provider for the particular service requested. The option then is to switch the call from the cellular phone directly to the service provider via switch 72 so that the caller of the services may be directly patched to the service provider. Alternatively, the central office dispatch center may be interfaced with the service provider directly such that the dispatch center places a call at 74 to the particular service provider.⁶⁰

⁵⁸ See *Tendler* Col. 6, lines 1-4.

⁵⁹ See Response to Office Action dated May 03, 2004 at page 7

⁶⁰ See *Tendler* at Col. 5, lines 55-65.

Referring to Figure 1, *Tendler* clearly illustrates that the switch (72) is defined as “SWITCH CALL TO SERVICE PROVIDER.” Furthermore, the switch (72) connects to the local exchange (54). As such, *Tendler* teaches that the user’s phone call is transferred to the nearest found service provider of the requested service. *Tendler* contains no disclosure that the remote location is displayed on the user PC.

However, even if the dispatch center is interpreted to be the user PC, which Appellants contend it is not, *Tendler* does not teach that the information from the remote location is displayed on a display associated with the user PC. *Tendler* does disclose that the dispatch center has an associated monitor. The relevant portion of *Tendler* states:

For convenience, a monitor 76 may be provide with maps 78 on which the *location of the caller*, in this case vehicle location 80, is depicted by a cursor 82. In this manner, the operator at the central office dispatch center can track the progress of the vehicle and can verbally communicate with the service provider as to the location of the caller.⁶¹ (*emphasis added*)

However, this monitor displays the location of the caller. *Tendler* contains no disclosure that information is delivered from the “remote location on the network” and displayed on the monitor. *Tendler* receives a vendor location from a local database and displays a user location on the monitor. Furthermore, *Tendler* does not disclose that the dispatch center uses the unique code to access information across a network. Additionally *Tendler* teaches that the user would use the system while traveling in a vehicle. *Tendler* provides for hands-free connection as part of the vehicle-mounted cellular phone cradle. Clearly, *Tendler* would not be providing a display on a user device for use while the user is operating a vehicle. *Tendler* is concerned with *connecting* a caller with a service provider proximate to the caller’s location. *Tendler* is not concerned with *delivering* information to the caller.

The claim further requires that the user PC is controlled in accordance with the unique code to access the predetermined remote location. *Tendler* contains no teaching that the user PC is controlled in accordance with the unique code to access a predetermined remote location. The Examiner agrees with this assertion wherein the Examiner stated “Claims 2-4 and 11-13 are objected to as being dependent upon a rejected base claim, but would be allowable if re-written

⁶¹ See *Tendler* Col. 6, lines 5-11.

in independent form including all of the limitations of the base claim and any intervening claim.”⁶² At that time, Claim 2 read as follows:

The method of Claim 1, wherein the functional mode has associated therewith a unique code that comprises the unique information, which unique code is associated with the remote location, *such that the user PC is controlled in accordance with the unique code to access the predetermined remote location.*⁶³ *(emphasis added)*

The Examiner now cites *Tendler* to teach the user PC is controlled in accordance with the unique code to access the predetermined remote location.⁶⁴ The relevant portion of *Tendler* states:

Since the database 68 contains the location of the service provider, this is correlated with the position of the cellular phone as generated at 64, with a unit 70 selecting the closest service provider for the particular service requested. The option then is to switch the call from the cellular phone directly to the service provider via switch 72 so that the caller of the services may be directly patched to the service provider. Alternatively, the central office dispatch center may be interfaced with the service provider directly such that the dispatch center places a call at 74 to the particular service provider.⁶⁵

Tendler is teaching the dispatch center either connects the user to the service provider, or places a call to the service provider. Additionally, *Tendler* teaches that an operator, upon receiving a service-request call from a caller, enters the service request, caller location, and, optionally, the vehicle identification number and cell phone number into a keypad. The relevant portion of *Tendler* states:

Upon receipt of a call, the operator types in the service request, the latitude and longitude, and, optionally, the vehicle identification number and cell phone number at a keypad 60 which encodes the service request at 62 and the position at 64, the indicated data being coupled to a CPU 66 which accesses a database 68. The database has incorporated therein the location of

⁶² See Office Action mailed February 27, 2006, paragraph 7, page 6.

⁶³ See Dependent Claim 2 as written in the Response to Office Action mailed November 21, 2005, In the Claims, on page 2.

⁶⁴ See Final Office Action, mailed November 16, 2006, paragraph 6, page 4.

⁶⁵ See *Tendler* at Col. 5, lines 55-65.

the particular service provider, the services rendered by the service provider, the rates for the service, and any other information useful in the provision of the service.⁶⁶

As such, it is an operator, not a unique code that controls the CPU. Although *Tendler* mentions that the process can be automatically implemented, *Tendler* contains no enabling disclosure how such operation would be facilitated.

The second step of Claim 1, of the instant application, requires associating at least one button on the cellular telephone with the functional mode. Appellants agree that *Tendler* associates buttons on the cellular phone with a specific function of dialing a predetermined phone number.

Utilizing the invention in Claim 1 of the instant application, a user, possessing a cellular phone, approaches a user PC. The cellular phone has at least one button associated to a functional mode. When the user is in physical proximity to the user PC, the user activates a functional mode on the cellular phone. Then, the cellular phone transmits a unique code to the user PC. This unique code is associated to the functional mode on the cellular phone. The unique code also is associated with a predetermined remote location on the network. Though the unique code contains no routing information that would identify the network address of the remote location, the user PC uses the unique code to receive information from the remote location on the network. Once the user PC receives the information from the remote location on the network, the user PC displays the information on an associated display. Therefore, the user is able to view information from a remote location on the network, such as a vendor website, without ever touching the user PC. The user only activates the functional mode on their cellular phone in order to view the information on their PC.

Tendler seeks to provide consumers roadside or other services when a user is traveling in unfamiliar territory. Additionally, *Tendler* teaches a user dialing a predetermined phone number to connect to a dispatch center with a database containing the physical locations of various

⁶⁶ See *Tendler* at Col. 5, lines 44-54.

service providers.⁶⁷ The dispatch center in *Tendler* uses the user's current location in order to connect the user to the nearby service provider via a telephone line.

Tendler only discloses providing a caller ID, a vehicle identification number, and the location of the user. *Tendler* provides no teaching or suggestion that provides for a unique code that is associated to a functional mode and a predetermined remote location on the network. Further, *Tendler* does not disclose a user PC in physical proximity to the cellular phone. A user PC in physical proximity to the cellular phone does not enhance or further the solution of providing roadside or other services when a user is traveling in unfamiliar territory. A cellular telephone with a functional mode having associated therewith a unique code provides an additional ability that may be used to access vendor sites on the Web. The unique code set forth in Claim 1 has no relationship with a physical location. It does not allow a user to better receive roadside or other services that currently are near to the user's location.

According to the present invention, if a user was not in physical proximity to the user PC, no information would be transferred. The cellular phone, with a functional mode associated with a unique code, provides a better way for a user to control a user PC to access information from a predetermined vendor website. The user is in physical proximity to a user PC. Therefore, it does not facilitate the purpose of *Tendler*, i.e., to provide roadside or other services when a user is traveling in unfamiliar territory.

Thus, to apply *Tendler* for the purpose of anticipating Claim 1 in the present application, the Examiner must show that *Tendler* teaches, expressly or inherently, each and every element of Appellants' present claims such that one skilled in the art would see no difference between the instant application and the cited reference. *Tendler* does not meet this requirement.

3. Conclusion

Tendler provides a system that uses GPS information received from a user in order to locate service providers proximate to the user. The GPS information is the latitude and longitude of the user. When a user activates a service-request button, the cellular phone dials the dispatch center and transmits a request for a service and the GPS information. The dispatch center

⁶⁷ See *Tendler* at Col 5, lines 55-65.

operator keys in this information in order to look up the service provider that is closest to the location of the user. Once the closest service provider is found, the dispatch center operator transfers the user's phone call to the service provider. As a database residing on a dispatch center CPU is used, *Tendler* contains no predisposition to have a unique code having a predetermined association with a remote location on the network. *Tendler* is only concerned with connecting to the user, while driving in their car, to the closest service provider. As such, there is no description or teaching in *Tendler* that a unique code would be used to control a user's PC to retrieve information from remote location on the network and display it on the user PC for the user to view. Furthermore, *Tendler* is a system for communicating a user location through a cellular telephone connection, and would not benefit from the cellular telephone being in physical proximity to the user PC.

The Examiner's position is conclusory. The Examiner states that *Tendler* would provide a functional mode on a cellular phone for web access wherein the functional mode is associated with a unique code, and wherein the unique code has a predetermined association with a remote location on the web; such that information from the remote location on the network is retrieved and displayed on a display of a user PC. However, the Examiner has not directed Appellants to any teaching in *Tendler* that the web is accessed or that a unique code or user PC exists. Additionally, the Examiner has failed to point to any teaching in *Tendler* that, if a user PC existed, the transmission of information would occur when the cellular telephone was in physical proximity to the user PC. In summary, Appellants submit that the Examiner has failed to provide a *prima facie* case as to why *Tendler* anticipates Appellants' present inventive concept, as defined by Claim 1.

D. Independent Claim 10 as rejected as being anticipated by *Tendler*.

Independent Claim is directed to an apparatus for accessing information over a network from a remote location on the network for delivery to a user PC. The apparatus includes a cellular telephone for providing a *functional mode for web access over the network*, the cellular telephone separate from the *user PC*, the *functional mode having associated therewith a unique code*. The apparatus further includes at least a button on said cellular telephone associated with said functional mode, wherein said button on said cellular telephone is activated to initiate said functional mode when the user is in *physical proximity to the user PC* and transfer to the user PC

the unique code, which unique code has no routing code contained therein that would by itself uniquely identify the location of the remote location on the network, but which *unique code has a predetermined association with the remote location*; and wherein, in response to activation of the functional mode, the user PC utilizes said unique code received from this cellular telephone and the predetermined association thereof with the remote location to *access information from the remote location on the network for delivery to the user PC and display thereof of said information on a display associated with the user PC*; such that the *user PC is controlled* in accordance with said unique code to access said predetermined remote location.

Independent Claim 10 contains limitations as found in Independent Claim 1. Therefore, Independent Claim 10 is allowable for at least the same reasons as Independent Claim 1.

E. Dependent Claims 3-4, 7, 12-13 and 16 as objected to as being dependent upon a rejected base claim.

Claims 3-4 and 7 depend from, and further limit, Independent Claim 1, while Claims 12-13 and 16 depend from, and further limit, Independent Claim 10. These dependent claims are allowable for at least the same reasons as the claims from which they depend, as discussed above.

Furthermore, the Examiner stated in the Final Office Action, mailed November 16, 2006: “Claims 3-4, 7, 12-13 and 16 would be allowable if rewritten independent form including all of the limitations of the base claim and any intervening claims.” In a non-entered Amendment, Appellants amended Claim 1, incorporating the limitations as found in Claim 3.⁶⁸ Since the limitations found in Claim 3 were incorporated into Independent Claim 1, Appellants cancelled Claim 3. Additionally, Appellants amended Claim 10, incorporating limitations as found in Claim 12 and canceling Claim 12.⁶⁹

However, in the Advisory Action mailed January 11, 2007, the Examiner maintained the objection to Claims 3-4, 7, 12, 13 and 16. The Examiner states:

Appellants request for reconsideration has been considered but does not place the application in condition for allowance because:

⁶⁸ See non-entered Amendment dated November 30, 2006, page 6 Exhibit F

⁶⁹ See non-entered Amendment dated November 30, 2006, page 6 Exhibit F

A telephone call was made to applicant's representative . . . to discuss incorporating claim 7 or any claim language from claim 7 in order to place the application in condition for allowance. Even though Applicant incorporated claims 2 and 3 which were objected by the Examiner, the applicant did not incorporate claim 7, which was also objected. However, the applicant's representative did not agree to incorporate claim 7 or any language from the claim.⁷⁰

Dependent Claim 3 is directed to a method of Claim 1 wherein the step of providing the functional mode comprises *storing* the unique code in the cellular telephone, which unique code is associated in the step of associating with the button, such that the unique code is output as a function of activation of the button in the step of activating for delivery to the user PC in the step of controlling.

The Examiner has not provided a citation or argument illustrating where *Tendler* teaches storing a unique code in the cellular telephone, as the Examiner took the position that this claim was allowable if it incorporated the limitations of any intervening claim and then later indicated such was not the case *without* providing any support whatsoever for such position. *Tendler* contains no teaching that an operation exists to store a unique code in the cellular telephone. The cellular telephone, in *Tendler*, dials a pre-determined telephone number. The relevant portion of *Tendler* reads:

In summary, a wireless phone based system is provided to accommodate users of phones for transmitting information as to the location of certain services such as gasoline stations, movie theatres, drug stores, etc., in which the phone includes a GPS receiver with the phone adapted to call a predetermined number requesting the desired service and providing the location of the phone.⁷¹

Each of buttons 36-44 is utilized to cause cellular phone 10 to *dial a predetermined number* when the corresponding button is depressed. This is accomplished through the cellular phone bus, with buttons 36-44 coupled to an internally carried interface board 46 that, upon sensing a switch closure, provides a suitable signal to the bus between it and the cellular phone for causing the cellular phone to dial a predetermined number.

⁷⁰ See Advisory Action mailed January 11, 2007, page 2

⁷¹ See *Tendler*, Col. 4, lines 6-12

The result of the depression of any one of the service-request buttons is the activation of the cellular phone to *dial the predetermined number* and to transmit the requisite information either verbally or digitally that there is a service request, the vehicle number, the latitude and longitude of the cell phone as sensed by the GPS receiver, along with the cellular phone number for both billing and call-back purposes.⁷²

An E² ROM 114 is *utilized to store the preprogrammed telephone numbers* and other data that is used by CPU 104 to control the operation of cell phone 10 through its audio/digital circuitry 102.⁷³

Clearly, the number dialed by the cellular phone is predetermined. As such, *Tendler* does not teach storing the unique code in the cellular phone, which the unique code is associated in the step of associating with the button, such that the unique code is output as a function of activation of the button in the step of activating for delivery to the user PC in the step of controlling.

F. Dependent Claims 5 and 14 as rejected as being anticipated by *Tendler*.

The Examiner stated in the Final Office Action, mailed November 16, 2006:

As per claims 5 and 14, *Tendler* discloses:

wherein the step of transmitting comprises transmitting via a wireless mode (col. 5, lines 44-54).⁷⁴

Claim 5 depends from, and further limits, Independent Claim 1, while Claim 14 depends from, and further limits, Independent Claim 10. These dependent claims are allowable for at least the same reasons as the claims from which they depend, as discussed above.

G. Dependent Claims 6 and 15 as rejected as being anticipated by *Tendler*.

The Examiner stated in the Final Office Action, mailed November 16, 2006:

As per claims 6 and 15, *Tendler* discloses:

wherein the step of transmitting via the wireless mode includes transmitting via an optical link (col. 6, lines 41-54).⁷⁵

⁷² See *Tendler*, Col. 5, lines 5-21

⁷³ See *Tendler*, Col. 6, lines 49-52

⁷⁴ See Final Office Action mailed November 16, 2006 at page 4.

⁷⁵ See Final Office Action mailed November 16, 2006 at page 4.

However, *Tendler* contains no disclosure to transmit any information via an optical link. The relevant portion of *Tendler* cited by the Examiner states:

Referring now to FIG. 3, cellular phone 10, in general, has RF circuitry 100 and audio/digital circuitry 102 for the provision of cellular phone calls. Speech and dialer board 18 includes CPU 104 which includes a hardware UART 106 and a software UART 108, with CPU 104 being coupled to a speech synthesizer 107 for the purpose of providing the requisite service-request message via an audio line 108 through an audio mixer 110 to an audio in terminal 112 of the audio/digital circuitry. An E.sup.2 ROM 114 is utilized to store the preprogrammed telephone numbers and other data that is used by CPU 104 to control the operation of cell phone 10 through its audio/digital circuitry 102. For this purpose., (*sic*) a TX data line 116 is provided to control the dialer section and all phone related functions for cellular phone 10.⁷⁶

Tendler discloses the circuitry of an exemplary cellular phone incorporating RF circuitry and audio/digital circuitry for the provision of cellular phone calls. However, *Tendler* contains no disclosure regarding an optical link. Dependent Claims 6 and 15 require transmitting via an optical link. In the instant application, when the cellular telephone is in physical proximity to the user PC, the cellular telephone is able to transmit, *optically*, the unique code upon activation of the functional mode. *Tendler* makes no provision for transmitting any information through any means other than via a cellular telephone connection. Therefore, *Tendler* fails to anticipate transmitting via an optical link.

Additionally, Claim 6 depends from, and further limits, Independent Claim 1, while Claim 15 depends from, and further limits, Independent Claim 10. These dependent claims are allowable for at least the same reasons as the claims from which they depend, as discussed above.

H. Dependent Claims 8 and 17 as rejected as being anticipated by *Tendler*.

The Examiner stated in the Final Office Action, mailed November 16, 2006:

As per claim 8 and 17, Tendler discloses:

⁷⁶ See *Tendler*, Col. 6, lines 41-54.

wherein the step of transmitting comprises an audio signal wherein the step of receiving comprises receiving and detecting the audio signal and extracting the information in the unique code therefrom (col. 6, lines 41-49).⁷⁷

Dependent Claim 8, of the instant application, is directed to the method of Claim 4 wherein the step of transmitting comprises transmitting an audio signal wherein the step of receiving comprises receiving and detecting the audio signal and extracting the information in the unique code. Dependent Claim 17 is directed towards an apparatus of Claim 13 wherein the step of receiving comprises receiving and detecting the audio signal and extracting the information in the unique code. As stated herein above with respect to Independent Claim 1, *Tendler* contains no disclosure regarding a unique code. Additionally, *Tendler* contains no disclosure of detecting an audio signal or extracting information in the unique code. The relevant portion of *Tendler* cited by the Examiner states:

Referring now to FIG. 3, cellular phone 10, in general, has RF circuitry 100 and audio/digital circuitry 102 for the provision of cellular phone calls. Speech and dialer board 18 includes CPU 104 which includes a hardware UART 106 and a software UART 108, with CPU 104 being coupled to a speech synthesizer 107 for the purpose of providing the requisite service-request message via an audio line 108 through an audio mixer 110 to an audio in terminal 112 of the audio/digital circuitry.⁷⁸

Tendler does teach an audio line. However, *Tendler* does not disclose that a user PC detects an audio signal. *Tendler* teaches that a cellular phone *dials a pre-determined number*. The dispatch center, receives the telephone call.⁷⁹ Therefore, even if the dispatch center is considered the user PC, with Appellants contend it is not, the dispatch center does not detect an audio signal. The dispatch center only answers a phone call.

Furthermore, as stated hereinabove with respect to Independent Claim 1, the predetermined cellular number, the GPS information, and the vehicle identification cannot be considered to be a unique code. However, even if any one of these were to be considered a unique code, which Appellants contend that they are not, none contains information that is

⁷⁷ See Final Office Action mailed November 16, 2006 at page 5.

⁷⁸ See *Tendler*, Col. 6, lines 41-49.

⁷⁹ See *Tendler*, Col. 5, lines 15-45 wherein the depression of the button activates the cellular phone to dial a predetermined number and wherein the central office dispatch center receives the call.

subsequently extracted. The cellular phone dials the predetermined number. Thereafter, the predetermined number is no longer used. The dispatch center uses the GPS information to identify what vendors are near, geographically, to the user. Additionally, the dispatch center uses the vehicle identification number, if provided, to identify the user for billing purposes. In contrast, the method and apparatus, as defined by Dependent Claims 8 and 10, extracts information from the unique code. This unique information has a predetermined association with a remote location on the network, as described hereinabove with respect to Independent Claim 1. Therefore, *Tendler* fails to teach or anticipate detecting an audio signal and extracting information from a unique code.

Additionally, Claim 8 depends from, and further limits, Independent Claim 1, while Claim 17 depends from, and further limits, Independent Claim 10. These dependent claims are allowable for at least the same reasons as the claims from which they depend, as discussed above.

I. Dependent Claims 9 and 18 as rejected as being anticipated by *Tendler*.

The Examiner stated in the Final Office Action, mailed November 16, 2006:

As per claims 9 and 18, *Tendler* disclose: (*sic*)

wherein the network is a global communication network (col. 2, lines 63-66).⁸⁰

Dependent Claim 9, of the instant application, is directed to the method of Claim 1 wherein the network is a global communication network. Dependent Claim 17 is directed towards an apparatus of Claim 1 wherein the network is a global communication network. The Examiner has provided *Tendler* to teach that the network is a global communication network. The relevant portion of *Tendler* cited by the Examiner states:

It will be appreciated that the service can be provided either by the central dispatch office which takes care of the individual needs of the motorist, or the motorist can merely be put in touch with the service provider through a direct link of the cell phone call to the service provider.⁸¹

⁸⁰ See Final Office Action mailed November 16, 2006 at page 5.

⁸¹ See *Tendler*, Col. 2, lines 63-67.

Tendler is directed towards a system that uses a cellular access network. *Tendler* contains no disclosure that any information is accessed over a global communication network. Furthermore, *Tendler* uses the wireless network to connect the cellular phone to the dispatch center. *Tendler* does not provide a global communication network to connect a user PC, or the dispatch center, to a remote location on the global communication network.

Additionally, Claim 9 depends from, and further limits, Independent Claim 1, while Claim 18 depends from, and further limits, Independent Claim 10. These dependent claims are allowable for at least the same reasons as the claims from which they depend, as discussed above.

J. Dependent Claims 21 and 22 as rejected as being anticipated by *Tendler*.

The Examiner stated in the Final Office Action, mailed November 16, 2006:

As per claims 21 and 22, *Tendler* discloses:

wherein the cellular telephone has a communication mode to allow voice communication where the cellular telephone communicates via a cellular telephone network and the step of transferring to the user PC the unique information occurs over a separate communication link between the user PC and the cellular telephone (col. 4, lines 6-27).⁸²

Dependent Claim 21, of the instant application, is directed to the method of Claim 1 wherein the cellular telephone has a communication mode to allow voice communication where the cellular telephone communicates via a cellular network and the step of transferring to the user PC occurs over a separate communication link between the user PC and the cellular telephone. Dependent Claim 22 is directed towards an apparatus of Claim 1 wherein the cellular telephone has a communication mode to allow voice communication where the cellular telephone communicates via a cellular network and the cellular telephone is operable to transfer to the user PC the unique information over a separate communication link between the user PC and the cellular telephone.

The Examiner has cited *Tendler* at column 4, lines 6-27 to provide support for the 35 U.S.C. § 102(e) rejection. The relevant portion of *Tendler* cited by the Examiner states:

⁸² See Final Office Action mailed November 16, 2006 at page 5.

In summary, a wireless phone based system is provided to accommodate users of phones for transmitting information as to the location of certain services such as gasoline stations, movie theatres, drug stores, etc., in which the phone includes a GPS receiver with the phone adapted to call a predetermined number requesting the desired service and providing the location of the phone. In one embodiment for vehicular applications, the GPS receiver is co-located with the phone, with the phone being carried in a handsfree cradle having a number of service-request buttons, such that depression of a service-request button activates the phone through its bus structure to call a predetermined number and provide the identity of the caller along with the caller's location. In a further embodiment, a single button is utilized to cause the phone to dial a concierge service, in which the concierge service has operators and a database, such that the operator to direct the caller to whatever service the caller desires having been apprised of the location of the phone, this to allow the operator can key in the latitude and longitude of the phone and access the database of services both as to the type of service and as to the location of the closest service provider.⁸³

Tendler is directed to a cellular phone that, upon depressing a button, dials a predetermined number. The cellular phone, containing a GPS receiver, transmits the latitude and longitude of the cellular phone via a cellular telephone connection to a dispatch center. Therefore, *Tendler* does teach a cellular phone having a communication mode to allow voice communications where the cellular telephone communicates via a cellular network. However, *Tendler* contains no disclosure that the cellular telephone is operable to communicate via a *separate* communication link to a user PC.

Dependent Claims 21 and 22 provide for a telephone that allows the user to talk via a cellular network capability of the cellular telephone; then, upon activation of a functional mode, transmit the unique information via a communication link that is not the same communication link as is used for the voice communications. Clearly, *Tendler* teaches only one communication link; that communication link being the communication link allowing voice communication. As such, *Tendler* contains no disclosure that teaches or anticipates providing a cellular telephone with a communication mode that allows a user voice communications via the cellular telephone network and a separate communication link to transmit the unique information to the user PC.

⁸³ See *Tendler*, Col. 4, lines 6-27

Additionally, Claim 21 depends from, and further limits, Independent Claim 1, while Claim 22 depends from, and further limits, Independent Claim 10. These dependent claims are allowable for at least the same reasons as the claims from which they depend, as discussed above.

VIII. Conclusion

In Summary, Appellants submit that the single reference cited by the Examiner fails to anticipate Appellants inventive concept as defined by the presented claims. Further, the cited reference fails to teach each and every limitation, expressly or inherently because the text fails to illustrate “why” one skilled in the art would see no difference between the instant application and the cited reference. Instead, the Examiner simply identifies particular components from the reference, construes them in a specific manner required by Appellants’ claimed invention, and then states that the cited reference anticipates. This is clearly conclusory reasoning that contravenes the standards imposed by both the MPEP and the Federal Circuit, and Appellants respectfully submit that the cited reference is improper for reasons detailed above and requests that the rejections under § 102 and objections be withdrawn.

Respectfully submitted,

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CLAIMS APPENDIX

1. A method for accessing information over a network from a remote location on the network for delivery to a user PC, comprising the steps of:

providing a functional mode on a cellular telephone for web access over the network, the cellular telephone separate from the user PC and the functional mode having
5 associated therewith a unique code;

associating at least a button on the cellular telephone with the functional mode;

activating the button on the cellular telephone to activate the functional mode when the user is in physical proximity to the user PC and, in response thereto, transferring to the user PC the unique code, which unique code has no routing code
10 contained therein that would by itself uniquely identify the location of the remote location on the network, but which unique code has a predetermined association with the remote location; and

in response to activation of the functional mode, the user PC then utilizes the unique code received from the cellular telephone and the predetermined association thereof with the remote location to access information from the remote location on the network for delivery to the user PC and display thereof on a display associated with the
15 user PC;

such that the user PC is controlled in accordance with the unique code to access the predetermined remote location.

2. (Cancelled)

3. The method of Claim 1, wherein the step of providing the functional mode comprises storing the unique code in the cellular telephone, which unique code is associated in the step of associating with the button, such that the unique code is output as a function of activation of the button in the step of activating for delivery to the user PC in the step of
5 controlling.

4. The method of Claim 3, wherein the step of activating comprises transmitting the unique code to the user PC and the user PC further including the step of receiving the unique code from the cellular telephone and, in response thereto, accesses the information from the remote location on the network.

5. The method of Claim 4, wherein the step of transmitting comprises transmitting via a wireless mode.

6. The method of Claim 5, wherein the step of transmitting via the wireless mode includes transmitting via an optical link.

7. The method of Claim 3, wherein the step of controlling the user PC further comprises the steps of:

receiving the unique code;

transmitting the unique code to an intermediate node on the network;

5 providing a relational database at the intermediate node on the network having contained therein a relational table between one or more unique codes and corresponding location information of the network;

comparing the unique code transmitted to the intermediate node with location information that resides in the informational database and, if there is a match,
10 transmitting the matched location information back to the user PC; and

connecting the user PC to the remote location in accordance with the matched location information returned thereto from the intermediate node.

8. The method of Claim 4, wherein the step of transmitting comprises transmitting an audio signal wherein the step of receiving comprises receiving and detecting the audio signal and extracting the information in the unique code therefrom.

9. The method of Claim 1, wherein the network is a global communication network.

10. An apparatus for accessing information over a network from a remote location on the network for delivery to a user PC;

a cellular telephone for providing a functional mode for web access over the network, the cellular telephone separate from the user PC, the functional mode having
5 associated therewith a unique code;

at least a button on said cellular telephone associated with said functional mode;

wherein said button on said cellular telephone is activated to initiate said functional mode when the user is in physical proximity to the user PC and transfer to the user PC the unique code, which unique code has no routing information contained therein
10 that would by itself uniquely identify the location of the remote location on the network,

but which unique information has a predetermined association with the remote location;
and

wherein, in response to activation of the functional mode, the user PC utilizes said
unique code received from this cellular telephone and the predetermined association
thereof with the remote location to access information from the remote location on the
network for delivery to the user PC and display thereof of said information on a display
associated with the user PC;

such that the user PC is controlled in accordance with said unique code to access
said predetermined remote location.

11. (Cancelled)

12. The apparatus of Claim 10, wherein the unique code is stored in said cellular
telephone, which said unique code is associated with said button, such that said unique code is
output to the user PC as a function of activation of said button.

13. The apparatus of Claim 12, wherein the unique code is transmitted to the user PC,
and the user PC said unique code is received from said cellular telephone and, in response
thereto, said information from said remote location on the network is accessed.

14. The apparatus of Claim 13, wherein said unique code is transmitted via a wireless
mode.

15. The apparatus of Claim 14, wherein said unique code is transmitted via an optical
link.

16. The apparatus of Claim 12, wherein the user PC is controlled to receive said
unique code, and to transmit said unique code to an information system on the network, said
information system on the network comprising:

an intermediate node which receives the unique code; and

a relational database at said intermediate node having contained therein a
relational table between one or more said unique codes and corresponding location
information of the network;

wherein said unique code which is transmitted to said intermediate node is
compared with said location information that resides in said relational database and, if
there is a match, transmitting said matched location information back to the user PC;

wherein the user PC is connected to said remote location in accordance with said matched location information returned thereto from said intermediate node.

17. The apparatus of Claim 13, wherein an audio signal is transmitted to the user PC, which user PC receives and detects said audio signal, and extracts said unique code therefrom.

18. The apparatus of Claim 10, wherein the network is a global communication network.

19. (Canceled)

20. (Canceled)

21. The method of claim 1, wherein the cellular telephone has a communication mode to allow voice communication where the cellular telephone communicates via a cellular telephone network and the step of transferring to the user PC the unique code occurs over a separate communication link between the user PC and the cellular telephone.

22. The apparatus of claim 10, wherein the cellular telephone has a communication mode to allow voice communication where the cellular telephone communicates via a cellular telephone network and the cellular telephone is operable to transfer to the user PC the unique code over a separate communication link between the user PC and the cellular telephone.

EVIDENCE APPENDIX

- A. U.S. Patent No. 6,519,463 to Tendler (“Tendler”) found on pages 2-5 of the Office Action (dated February 2, 2004), found on pages 3-6 of the Office Action (dated May 20, 2005), found on pages 4-7 of the Office Action (dated February 27, 2006), and found on pages 3-5 of the Final Office Action (dated November 16, 2006).
- B. U.S. Patent Application No. US2003/0095525 to Lavin et al. (“Lavin”) found on pages 2, 3 and 5 of the Office Action (dated July 2, 2003).
- C. U.S. Patent No. 6,138,036 to O’Cinneide (“O’Cinneide”) found on pages 2-7 of the Office Action (dated July 2, 2003).
- D. U.S. Patent No. 6,148,405 to Liao et al. (“Liao”) found on pages 2-8 of the Office Action (dated August 24, 2004).
- E. U.S. Patent No. 6,108,656 to Durst et al. (“Durst”) found on pages 2-7 of the Office Action (dated August 24, 2004).
- F. Non-Entered Amendment After Final dated December 2, 2006.
- G. *Abbott Laboratories v. Syntron Bioresearch, Inc.*, 334 F.3d 1343, 1350 (Fed. Cir. 2003)
- H. *Akamai Technologies, Inc v. Cable & Wireless Internet Services, Inc.*, 344 F.3d 1186, 1192 (Fed. Cir. 2003)
- I. *Atlas Powder Co. v. Ireco Inc.*, 190 F.3d 1342, 1347 (Fed. Cir. 1999)
- J. *Biacore v. Thermo Bioanalysis Corp.*, 79 F. Supp. 2d 422, 459 (D. Del. 1999)
- K. *Continental Can Co. USA, Inc. v. Monsanto Co.*, 948 F.2d 1264, 1267-68 (Fed. Cir. 1991)
- L. *Dayco Prods., Inc. v. Total Containment, Inc.*, 329 F.3d 1358, 1368 (Fed. Cir. 2003)
- M. *In re Paulsen*, 30 F.3d 1475, 1478-79 (Fed. Cir. 1994)
- N. *In re Yamamoto*, 740 F.2d 1569, 1571 (Fed. Cir. 1984)
- O. *In re Zletz*, 893 F.2d 319, 321-22 (Fed. Cir. 1989)
- P. *Lacks Industries, Inc. v. McKechnie Vehicle Components USA, Inc.*, 322 F.3d 1335 (Fed. Cir. 2003)
- Q. *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 979 (Fed. Cir. 1995)
- R. *Mehl/Biophile Int’l Corp. v. Milgraum*, 192 F.3d 1362, (Fed. Cir. 1999)
- S. *Omega Eng’g v. Raytek Corp.*, 334 F.3d 1314, 1323 (Fed. Cir. 2003)
- T. *Rosco v. Mirror Lite*, 304 F.3d 1373, 1380 (Fed. Cir. 2002)
- U. *Vitronics Corp. v. Conceptiontronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996)



US006519463B2

**(12) United States Patent
Tendler****(10) Patent No.: US 6,519,463 B2****(45) Date of Patent: *Feb. 11, 2003****(54) LOCATION BASED SERVICE REQUEST
SYSTEM****(75) Inventor: Robert K. Tendler, Chestnut Hill, MA
(US)****(73) Assignee: Tendler Cellular, Inc., Boston, MA
(US)****(*) Notice:** This patent issued on a continued prosecution application filed under 37 CFR 1.53(d), and is subject to the twenty year patent term provisions of 35 U.S.C. 154(a)(2).

Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(h) by 0 days.

(21) Appl. No.: 08/608,482**(22) Filed: Feb. 28, 1996****(65) Prior Publication Data**

US 2002/0068549 A1 Jun. 6, 2002

(51) Int. Cl. 7: H04Q 7/20**(52) U.S. Cl. 455/456; 455/404****(58) Field of Search 455/550, 422,
455/436, 438, 440, 456, 445, 406, 557,
404; 379/45, 49****(56) References Cited****U.S. PATENT DOCUMENTS**

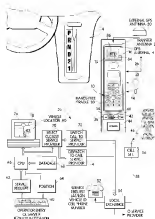
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Primary Examiner—Tracy Legree**(74) Attorney, Agent, or Firm—Robert K Tendler****(57) ABSTRACT**

A wireless phone based system to accommodate users of wireless phones for providing information as to the location of Certain services such as gasoline stations, movie theatres, drug stores, etc., includes the utilization of a GPS receiver and a wireless phone, with the wireless phone adapted to call a predetermined number requesting the desired service and providing the location of the cellular phone. In one embodiment, the GPS receiver is co-located with the wireless phone in a car, with the wireless phone being carried in a handsfree cradle having a number of service-request buttons, such that depression of a service-request button activates the wireless phone through its bus structure to call a predetermined number and provide the identity of the caller along with the caller's location. In a further embodiment, a single button, located on the phone or on the handsfree cradle, is utilized to cause the wireless phone to dial a concierge service, in which the concierge service has operators and a database, such that the operator can either direct the caller to whatever service the caller desires or take care of the request, with the operator having been apprised of the location of the wireless phone. This allows the operator to key in the latitude and longitude of the wireless phone and access the database of services both as to the type of service and as to the location of the closest service provider.

4 Claims, 3 Drawing Sheets

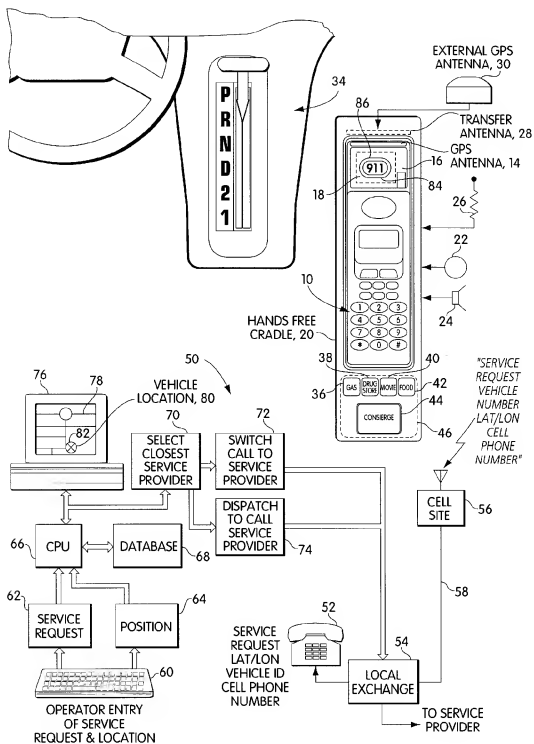


Fig. 1

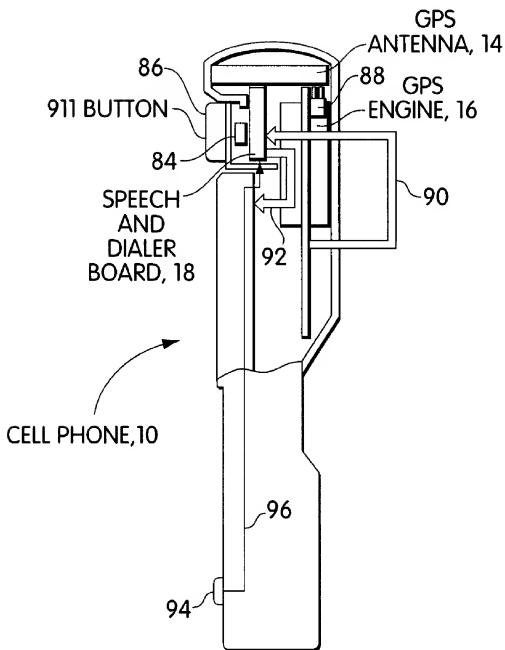


Fig. 2

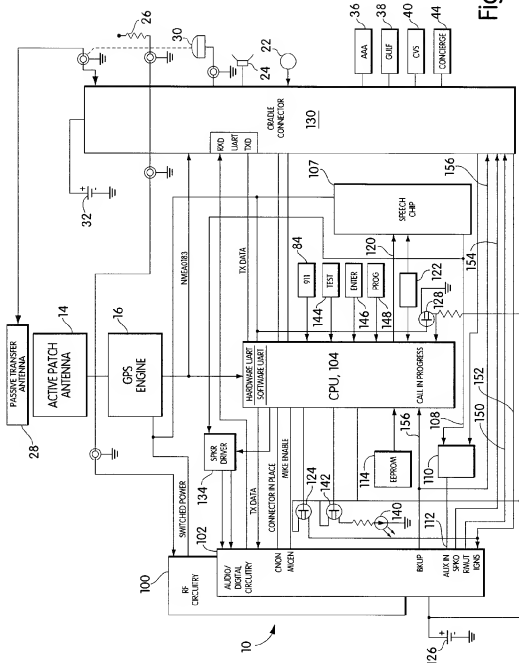


Fig. 3

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LOCATION BASED SERVICE REQUEST SYSTEM

FIELD OF INVENTION

This invention relates to a system for providing assistance to wireless phone callers, and more particularly, to a wireless phone and GPS-based assistance system.

BACKGROUND OF THE INVENTION

As is now common, central dispatch offices are utilized in the provision of roadside assistance through the utilization of an 800 number. Upon dialing a predetermined 800 number from a wireless phone such as a cellular phone, the central dispatch office, through the utilization of its database, can direct the motorist to a variety of different services. For instance, the central dispatch service can provide information as to the nearest towing service, the nearest gas station, the nearest theatre, the nearest drug store, or, in fact, any service of interest to the motorist for which the dispatch office has information in its database.

Moreover, with databases utilized at the central dispatch office, it is possible to keep medical records of individuals owning the phone on file so that in the case of a vehicular accident, these files can be accessed and the appropriate information can be given to rescue authorities.

One of the major drawbacks with the respect to such a system is that there is currently no easily implemented way to provide information as to the whereabouts of a vehicle. While, GPS-based systems exist for in-car mapping and other position related applications, such a system is not readily available to every motorist without an extensive retrofit of the vehicle and corresponding cell sites, making such systems infrastructure intense. It is in fact a daunting task to be able to provide GPS-based services by providing a GPS receiver in every motor vehicle, much less on a cost effective basis. Thus, it is only with reluctance that automobile manufacturers are providing automobiles with GPS receivers and antennas.

SUMMARY OF INVENTION

In the subject system, the problem of providing a cost effective means of providing roadside or other services is implemented by informing central dispatch offices of the location of a vehicle through the utilization of a wireless phone having an associated GPS receiver, antenna, and voice synthesis capability for transmitting not only the identity of the vehicle, but also the location of the vehicle in English or other spoken language.

In one embodiment, the phone is located in a handsfree cradle having service-request buttons to cause the phone to dial the central dispatch office with a service request and location of the phone. Through a synthetic voice announcement, when the phone calls the central dispatch office, the verbally announced information is processed by an operator, at which point the latitude and longitude of a vehicle is recorded. The central dispatch office then correlates the position of the vehicle with the services requested, with a match being performed to provide the identity and/or address of the nearest local service provider either to the dispatch operator or to the operator of the motor vehicle.

Thus, when traveling in unfamiliar territory, one need only press a button on the handsfree cradle of the phone, at which point the central dispatch office is dialed, and after synthetic voice communication with the dispatch office to

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indicate the location of the vehicle, two way verbal communication may be established to permit the driver to ask for whatever service he or she wants. This can be taken care of by the dispatch office, or the caller can be directly linked or patched to the service provider. Alternatively, the handsfree cradle may be provided with a number of different service related buttons such as "Gas Station", "Pharmacy", "Food", etc, so that these service providers are directly dialed.

As will be appreciated, the subject system provides the central dispatch office not only with the location of the caller, but also the nature of the requested service. This being the case, should a motorist be in an unfamiliar city and seek a particular service, with the touch of a button, the wireless phone is made to dial the central dispatch office, which in turn can either route the call to the appropriate service provider, or provide information back to the motorist so that the motorist can be directed to the service provider and/or the contact the service provider himself.

In one embodiment, the wireless phone is available as a unitary device with service-request buttons thereon. Alternatively, when utilized in a vehicle, the phone may be placed in the aforementioned handsfree cradle that has one or more service-request buttons on the cradle.

Note that in one embodiment, the cradle is provided with a passive transfer antenna to couple the relatively weak GPS signals from an active GPS antenna mounted outside the car to the internally carried GPS antenna in the phone. The result is to be able to receive the relatively weak GPS signals within the body of the vehicle through the utilization of the transfer antenna, with the transfer antenna being mounted at the handsfree cradle adjacent the GPS antenna that is carried by the unitary phone.

The abovementioned handsfree cradle communicates the fact of a service-request button push to a printed circuit board within the phone, with the printed circuit board carrying a CPU, a speech synthesizer and a dialer. The board is connected to the phone bus which is also connected to the handsfree cradle such that when the phone is placed in the handsfree cradle, the service-request buttons cause the phone to dial the appropriate number with the appropriate message and position of the phone. As a result, with a single button push at the handsfree cradle, one or more services can be requested through the corresponding switch closure being transmitted to the CPU on the printed circuit board within the phone. When the switch closure is sensed, the phone is made to dial a predetermined number followed by transmission of the corresponding message.

It will be appreciated that any number of service-request buttons may be placed on the handsfree cradle such that the nearest gas station, the nearest pharmacy, or the nearest grocery store can be requested through the dialing of a separate number associated with each of the buttons. In another embodiment, a single "Concierge" button is provided to enable the central dispatch office to call the appropriate service provider directly, and as an added service, pass the call through to the service provider. As such a location-dependent concierge service is provided. In summary, either through a single Concierge button or with multiple specific service-request buttons, the motorist can be given the services that he or she desires due to the provision of the caller's location from a GPS receiver at the phone.

It will be appreciated that the service can be provided either by the central dispatch office which takes care of the individual needs of the motorist, or the motorist can merely be put in touch with the service provider through a direct link of the cell phone call to the service provider. What will

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he apparent is that regardless of the form the service takes, the transmission of latitude and longitude provides a unique way of selecting the closest service provider.

While the subject invention relates to wireless phones in general, for convenience, the remainder of the description of the invention will center on its use with cellular phones. It will be appreciated that utilizing an existing cellular telephone and an internally carried GPS engine also solves the problem of economically providing a GPS receiver within a vehicle, since the cost of the cellular phone along with the GPS receiver is borne by the carrier and ultimately by the consumer on a monthly charge basis. The above enables a cost effective method of providing roadside assistance, while at the same time providing normal cellular communication through the utilization of a standard cellular phone modified with the GPS-based location system. The above also permits emergency signalling to public service access points or PSAP's as to the location of an accident or other emergency.

As will be seen, in one embodiment a unitary cellular phone is provided with an internal GPS engine, an internal GPS antenna, and an internal printed circuit board having a speech synthesizer for providing a verbal rendition of the latitude and longitude of the cellular phone, along with a dialer which is coupled to the cell phone bus to control the functioning and the modulation of the cellular phone.

While the above has described a unitary cellular phone with a GPS receiver, a speech synthesizer, a CPU and a GPS antenna within the cellular phone, in an alternative embodiment, the GPS receiver, the location/speech circuit including speech synthesizer and CPU, and an external GPS antenna may be provided in the abovementioned handsfree cradle. In this embodiment, circuits within the cradle cause the phone to dial and provide modulation of the phone with a verbal message through the normal bus structure of the cellular phone. As a result, standard cellular phones can be modified through the utilization of such a handsfree cradle to provide the needed location function.

It will, therefore, be appreciated that the GPS receiver and the speech synthesizer and dialer board may be carried in the handsfree cradle rather than within the cellular phone. The information from the GPS unit is provided, in this instance, to the CPU that is coupled to the speech synthesizer which couples the speech synthesizer output to the microphone input to the cell phone bus. The dialer board causes the phone to dial the indicated number by appropriate signalling over the cell phone bus. In this manner, by providing a handsfree cradle with a GPS receiver and speech and dialer board, vehicles can be retrofitted readily and inexpensively to provide a location-dependent request for services.

Whether the cellular telephone is a unitary device or whether the GPS receiver and other circuitry are built into the handsfree cradle, a cost effective system is provided to enable dispatch offices to correlate the position of a vehicle with the service required.

While the above has been described in connection with vehicle related services, it will be appreciated that taking the cellular phone out of the car and providing it with a service-request button can provide the non-motorist with a means of obtaining services that the individual might want. For instance, when a pedestrian in an unfamiliar city is seeking the nearest drug store, a Concierge button on the unitary cellular phone can provide the central dispatch office with the same information as described above, regardless of whether or not the GPS-based cellular phone is within a vehicle.

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It will also be appreciated, while the subject system has been described in connection with a synthetic voice announcement of the position of the phone, digital systems involving digital signalling of the same information are within the scope of this invention.

In summary, a wireless phone based system is provided to accommodate users of phones for transmitting information as to the location of certain services such as gasoline stations, movie theatres, drug stores, etc., in which the phone includes a GPS receiver with the phone adapted to call a predetermined number requesting the desired service and providing the location of the phone. In one embodiment for vehicular applications, the GPS receiver is co-located with the phone, with the phone being carried in a handsfree cradle having a number of service-request buttons, such that depression of a service-request button activates the phone through its bus structure to call a predetermined number and provide the identity of the caller along with the caller's location. In a further embodiment, a single button is utilized to cause the phone to dial a concierge service, in which the concierge service has operators and a database, such that the operator to direct the caller to whatever service the caller desires having been apprised of the location of the phone, this to allow the operator can key in the latitude and longitude of the phone and access the database of services both as to the type of service and as to the location of the closest service provider.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other features of the subject invention will be better understood taken in conjunction with the Detail Description in conjunction with the Drawings of which:

FIG. 1 is a diagrammatic and block diagram of the subject system illustrating the utilization of the cellular phone/GPS combination to transmit the location of the cellular phone to a central dispatch office for the provision of location-dependent services;

FIG. 2 is a diagrammatic illustration of a cellular phone housing a GPS receiver, GPS antenna, and speech and dialer board for the control and the modulation of the cellular phone as well as a service-request button coupled to the CPU/speech/dialer board for providing a unitary device; and,

FIG. 3 is a block diagram of the speech and dialer board of FIG. 2 illustrating its connection to RF and audio circuitry within the cellular phone.

DETAILED DESCRIPTION

Referring now to FIGS. 1 and 2, a cellular phone 10 within a vehicle 12 includes an internal GPS antenna 14 coupled to a GPS receiver 16, with the output of the GPS receiver coupled to a speech and dialer board 18 carried within the upper portion of cellular phone 10.

In the illustrated embodiment, cellular phone 10 is carried within a handsfree cradle 20 to which is attached the traditional handsfree microphone 22 and to which is coupled to an external speaker 24 as well as a vehicle mounted cellular phone antenna 26. Also carried within handsfree cradle 20, is transfer antenna 28 in close proximity to GPS antenna 14, will transfer antenna 28 coupled to an external active GPS antenna 30 which is powered by the vehicle battery as shown at 32.

Handsfree cradle 20 is conveniently located adjacent vehicle console 34 and carries a number of service request buttons 36, 38, 40, and 42, corresponding respectively as

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illustrated to a request for gas station location, drug store location, movie theatre location, and food services location. Also located on handsfree cradle 20, is a CONCIERGE button 44, which is utilized to obtain concierge services from a central office dispatch center as will be described.

Each of buttons 36-44 is utilized to cause cellular phone 10 to dial a predetermined number when the corresponding button is depressed. This is accomplished through the cellular phone bus, with buttons 36-44 coupled to an internally carried interface board 46 that, upon sensing a switch closure, provides a suitable signal to the bus between it and the cellular phone for causing the cellular phone to dial a predetermined number.

The result of the depression of any one of the service-request buttons is the activation of the cellular phone to dial the predetermined number and to transmit the requisite information either verbally or digitally that there is a service request, the vehicle number, the latitude and longitude of the cell phone as sensed by the GPS receiver, along with the cellular phone number for both billing and call-back purposes.

It will be appreciated that once having established contact with a central office dispatch center, not only is the particular service request known, but operators at the dispatch center can talk directly with the requesting individual.

In order for this to be accomplished, a dispatch center generally indicated by reference character 50 includes a telephone 52 coupled to a local exchange 54 which is in turn coupled to a cell site 56 by a land line 58, such that the location of the cell phone is made known to the central office dispatch center.

What is required at the central office dispatch center is a service request, the position of the cellular phone placing the service request, a vehicle identification number, if desired, and the cellular phone number of the cellular phone initiating the call.

While the following operation may be automatically implemented, the subject system will be described in terms of the synthesized voice verbal announcement of the service request, position, vehicle identification number and cell phone number, as reported to an operator at the central office dispatch center.

Upon receipt of a call, the operator types in the service request, the latitude and longitude, and, optionally, the vehicle identification number and cell phone number at a keypad 60 which encodes the service request at 62 and the position at 64, the indicated data being coupled to a CPU 66 which accesses a database 68. The database has incorporated therein the location of the particular service provider, the services rendered by the service provider, and, optionally, the availability of the service provider, the rates for the service, and any other information useful in the provision of the service.

Since database 68 contains the location of the service provider, this is correlated with the position of the cellular phone as generated at 64, with a unit 70 selecting the closest service provider for the particular service requested. The option then is to switch the call from the cellular phone directly to the service provider via switch 72 so that the caller of the services may be directly patched to the service provider. Alternatively, the central office dispatch center may be interfaced with the service provider directly such that the dispatch center places a call at 74 to the particular service provider.

In any event, the closest service provider is identified and is contacted either by the caller or the dispatch center so that

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the requisite services can be rendered. Because the cellular phone number or the vehicle identification number or both are provided to the central dispatch office, charges for the cellular based service request may be invoiced to the caller.

For convenience, a monitor 76 may be provided with maps 78 on which the location of the caller, in this case vehicle location 80, is depicted by a cursor 82. In this manner, the operator at the central office dispatch center can track the progress of the vehicle and can verbally communicate with the service provider as to the location of the caller.

It is also possible that database 68 have incorporated therein medical information of the owner of the cellular phone so that emergency services can be dispatched from the central dispatch office. For this purpose, an emergency button 84 is provided under a protective cover 86 which when pushed can either be made to dial 911 directly, or can be made to dial the dispatch center. The information transmitted from the cellular phone to the central office dispatch center, would thus, be a "MAYDAY" request followed by latitude and longitude to enable the central dispatch office to call the appropriate authorities.

Referring now to FIG. 2, cell phone 10 is shown as incorporating GPS receiver or engine 16, with speech and dialer board 18 being located ahead of the GPS engine. As can be seen, emergency button 84 is mounted to the speech and dialer board, with cover 86 being in place over emergency button 84 to prevent accidental actuation. As pictured, GPS antenna 14 is coupled to GPS engine 16 via connector 88, with location information coming from GPS engine 16 to speech and dialer board 18 via the NEMA 0183 bus 90. Also as depicted, a bus 92 runs between speech and dialer board 18 to cellular phone 10 for the control thereof and the modulation and the modulation section thereof.

If the system is to be provided as a unitary device, phone 10 is provided with one or more service-request buttons 94 coupled to speech and dialer board 18 via line 96. This avoids having to provide a handsfree cradle and makes the service-request system completely portable.

Referring now to FIG. 3, cellular phone 10, in general, has RF circuitry 100 and audio/digital circuitry 102 for the provision of cellular phone calls. Speech and dialer board 18 includes CPU 104 which includes a hardware UART 106 and a software UART 108, with CPU 104 being coupled to a speech synthesizer 107 for the purpose of providing the requisite service-request message via an audio line 108 through an audio mixer 110 to an audio in terminal 112 of the audio/digital circuitry. An E-ROM 114 is utilized to store the preprogrammed telephone numbers and other data that is used by CPU 104 to control the operation of cell phone 10 through its audio/digital circuitry 102. For this purpose, a TX data line 116 is provided to control the dialer section and all phone related functions for cellular phone 10.

It will be appreciated that CPU 104 provides control of speech synthesizer 107 via control lines 120, with a crystal 122 providing the speech clock.

Automatic turn-on of the cellular phone upon depression of a service-request button, is accomplished through a power enable transistor circuit 124 which is utilized to turn on the cellular phone, with the power being derived from phone battery 126 as illustrated. Note that the turning off of switched power by virtue of the turn off of the cellular phone is sensed by transistor circuitry generally illustrated at 128 so that CPU 104 can be placed in its low power drain mode.

As illustrated, handsfree cradle 20 has a cradle connector 130 to which service request buttons 36, 38, 40 and 44 may

he connected. These service requests are coupled to CPU 104 via software UART 108 over TX data line 132 so as to cause CPU 104 to initiate the appropriate service requests and to cause cell phone 10 to dial the appropriate number.

In the programming of E-PROM 114, an audio output of speech synthesizer 107 is utilized to drive an internal speaker of cell phone 110, not shown, via speaker driver 134 controlled by CPU 104 via volume control 136.

Also provided as inputs to CPU 104 is the aforementioned emergency button switch 84, a test button switch 144, an enter button switch 146, and a program switch 148 for the testing of the system and for the entering of predetermined numbers into E-ROM 114.

Also provided at the cell phone is an LED indicator 140 driven by transistor circuit 142 to indicate at the cell phone that a GPS fix has been achieved.

A receiver mute line 150 is provided from cradle 130 for muting car-mounted broadcast receivers, and an ignition sense line 152 is provided for informing the cellular phone that the handsfree cradle has been connected. A speaker out line 154 is provided from the cellular phone to the handsfree cradle for driving speaker 24 and a backup switch protection line 156 is provided for both informing CPU 104 that there is a call in progress and to provide this information to the handsfree cradle.

The call-in-progress line 156, called the; "back-up switch line", is utilized by CPU 104 to request further services, in the form of a 911 back-up call when after the 911 button has been pushed, the call has been terminated to the PSAP. The falling of the call-in-progress flag causes CPU 104 to have cell phone 10 dial a central office dispatch number with a specialized type of emergency service request. In one embodiment, the service request is to have the operators at the dispatch center first call the cellular phone to see if emergency services have been dispatched, and then to call the particular PSAP involved to assure that services have been rendered.

It will be appreciated that the system described in connection with FIG. 3 incorporates all of the functions on an internally carried speech and dialer board 18 carried within cell phone 10. However, as mentioned above, the entire function of the CPU, and in fact, the GPS receiver and active patch antenna can be carried within handsfree cradle 10 so that all that is necessary to initiate the call is controlling the normal cellular phone bus from the handsfree cradle.

However, providing all functions in the unitary phone results in the ability to request services from a unitary device without having to provide a handsfree cradle. As such, the subject system incorporates the concept of providing services regardless of whether or not the cellular phone is in a vehicle.

Having above indicated a preferred embodiment of the present invention, it will occur to those skilled in the art that modifications and alternatives can be practiced within the spirit of the invention. It is accordingly intended to define the scope of the invention only as indicated in the following claims.

What is claimed is:

1. In a wireless phone based system a method for selecting a third party concierge type location-based service provider based on the location of a mobile wireless phone so that services can be dispatched from the selected third party provider to the wireless phone user at the user's location without the necessity of manually verifying user's location, and in which wireless phone user is billed for the services provided by the third party concierge type location-based service provider in accordance with the transmission of the telephone number of the wireless phone, comprising:

providing a mobile wireless phone at one location, with the phone having means at the wireless phone for specifying the concierge type of service requested, and a GPS receiver for receipt of GPS satellite signals, and providing as an output signal the calculated geophysical coordinates of the one location;

transmitting the calculated geographical coordinates from the mobile wireless phone along with the service requested to a dispatch office as well as the telephone number of the mobile wireless phone;

determining from the transmitted GPS-generated geographical coordinates the closest third party location-based service provider of the concierge service requested;

selecting the closest concierge-type third party provider based on the transmitted GPS-generated geophysical coordinates and the transmitted service request without manual verification of the GPS-generated geographic coordinates; and,

billing the wireless phone user based on the transmitted telephone number and the service provided by said third-party service provider, whereby services may be dispatched by the automatically selected third party concierge-type location-based service provider directly to the location provided by the GPS-generated geophysical coordinates.

2. The method of claim 1 wherein said communication step includes patching said mobile wireless phone to said closest third party provider.

3. The method of claim 1 wherein said mobile wireless phone has a modulation section and wherein said transmitting step includes generating audio signals representing said calculated geophysical coordinates, and coupling said audio signals to the modulation section of said mobile wireless phone.

4. The method of claim 3 wherein said phone has a phone number and wherein said transmitting step includes generating audio signals representing said phone number such that said phone number is verbally transmitted and announced at said dispatch office.

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US 20030095525A1

(19) **United States**(12) **Patent Application Publication** (10) **Pub. No.: US 2003/0095525 A1**
(43) **Pub. Date: May 22, 2003**(54) **NAVIGATION CONTROL UNIT FOR A WIRELESS COMPUTER RESOURCE ACCESS DEVICE, SUCH AS A WIRELESS WEB CONTENT ACCESS DEVICE**(52) **U.S. CL.** **370/338; 370/352**(76) **Inventors:** Daniel Lavin, San Francisco, CA (US);
Henriette Wendt, London (GB);
Robert Cousins, Crawley (GB)(57) **ABSTRACT****Correspondence Address:**
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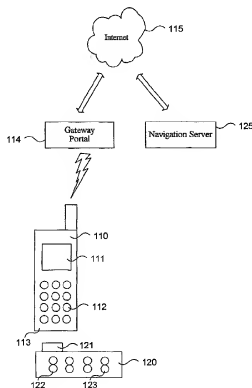
A navigation control unit for a wireless computer resource access device, such as a wireless web content access device, is disclosed. The navigation control unit includes a microprocessor that stores information regarding the navigation control unit. The microprocessor also processes user input received from a user. Input may be provided by any number of user input devices, such as button switches, voice activated commands, touch sensitive displays, and the like. The navigation control unit may be embodied as various components to be coupled with the wireless web content access device, such as a hands-free headset, a replaceable and rechargeable battery, a replaceable face plate, incorporated as hardware and/or software within the wireless device, etc. Furthermore, the navigation control unit may include additional functionality, such as audio source or playback devices, memory, positioning systems, biometric readers, data collection devices, etc. The navigation control unit may be separated into two portions, one of which is coupled to the wireless web content access device, and the other of which is a separate portion that communicates wirelessly with the first portion. Various other alternatives are described.

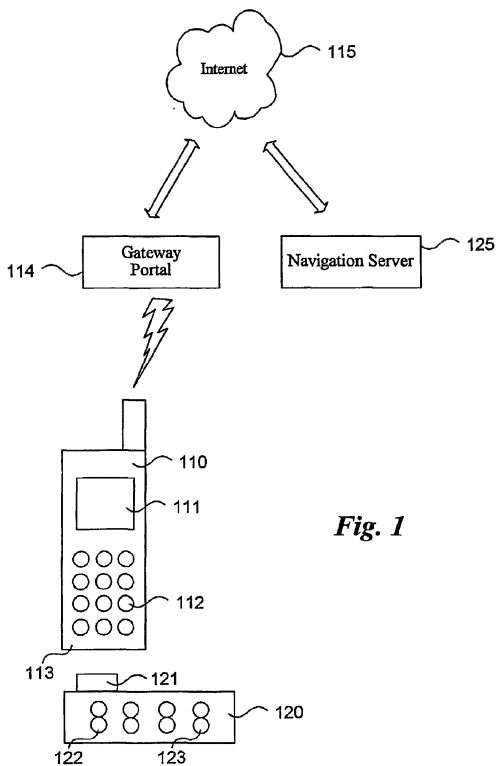
(21) **Appl. No.:** **10/269,162**(22) **Filed:** **Oct. 11, 2002****Related U.S. Application Data**

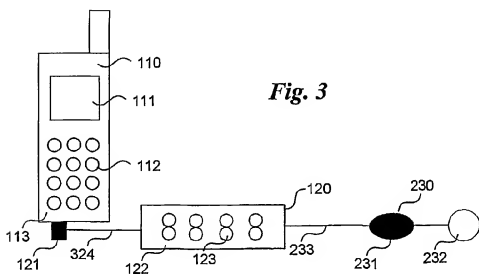
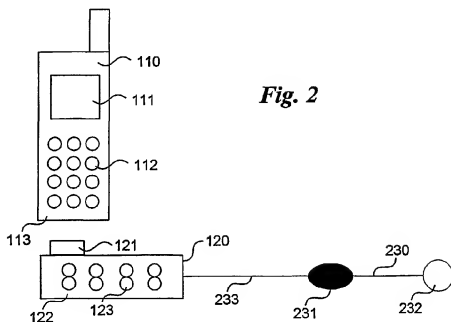
(63) Continuation of application No. PCT/US01/12168, filed on Apr. 12, 2001.

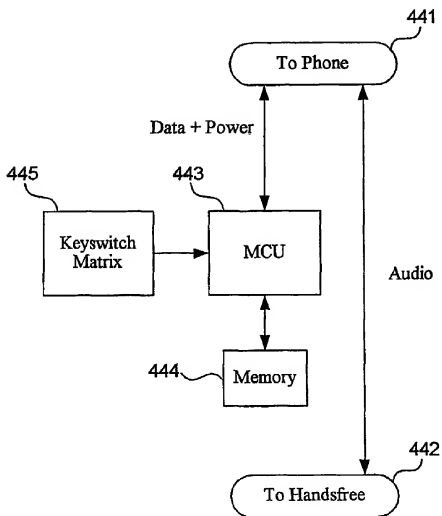
(30) **Foreign Application Priority Data**

Apr. 13, 2000 (GB) 0009004.3

Publication Classification(51) **Int. CL⁷** **H04Q 7/24**





***Fig. 4***

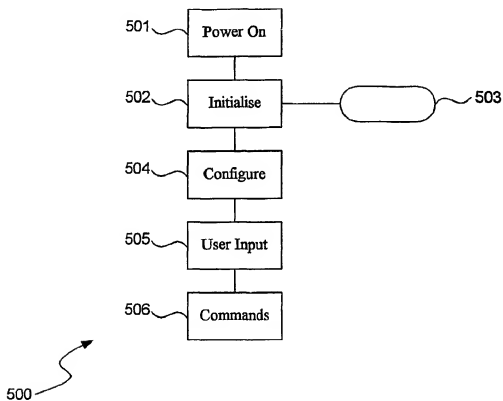
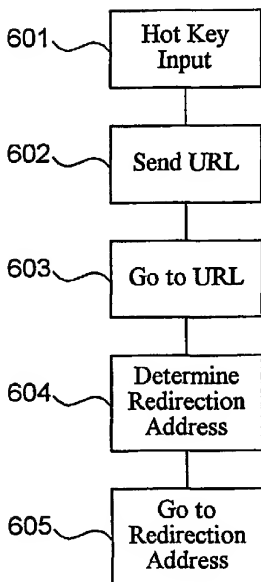


Fig. 5



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Fig. 6

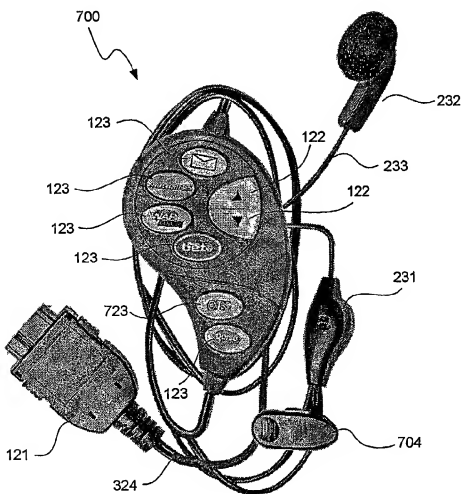


Fig. 7

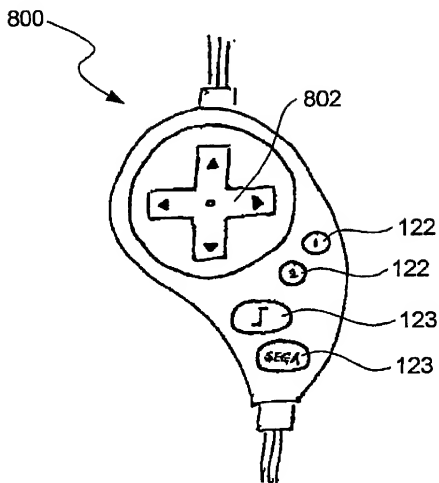


Fig. 8

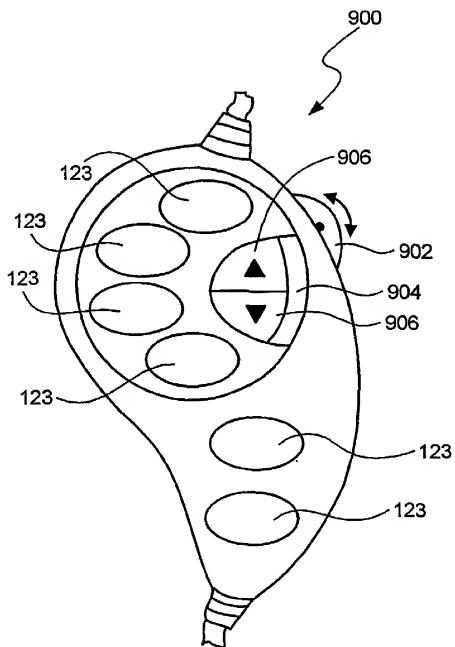


Fig. 9

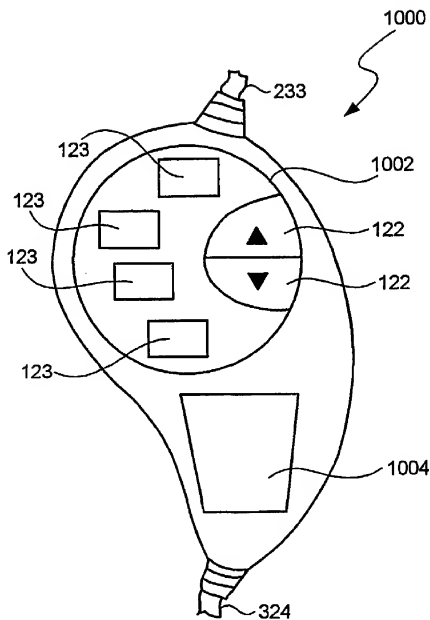
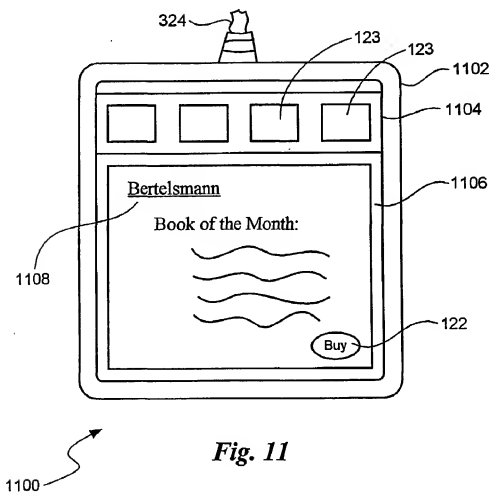


Fig. 10



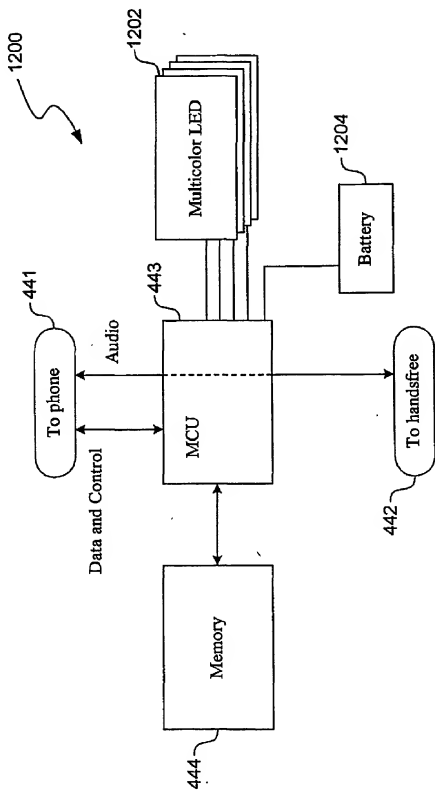


Fig. 12

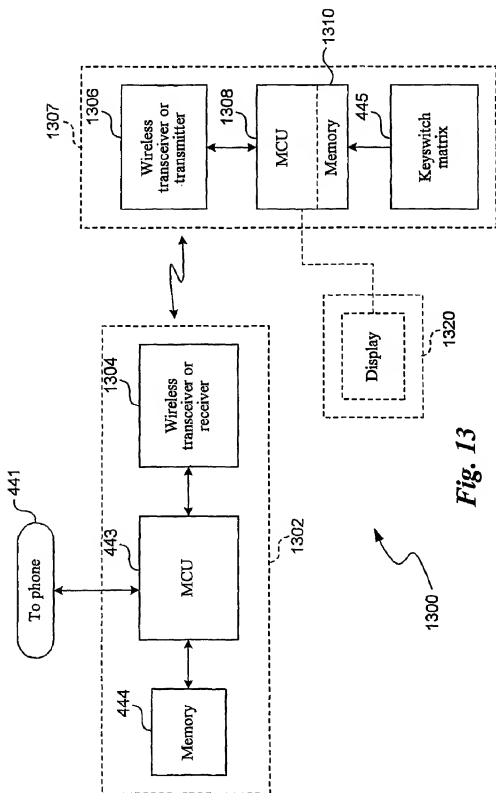


Fig. 13

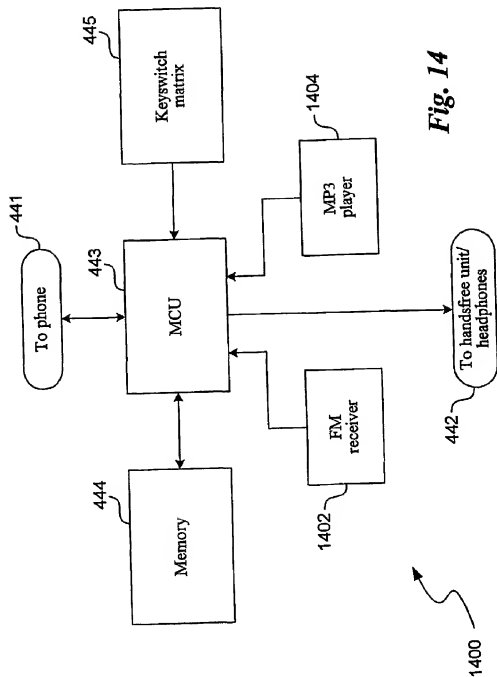


Fig. 14

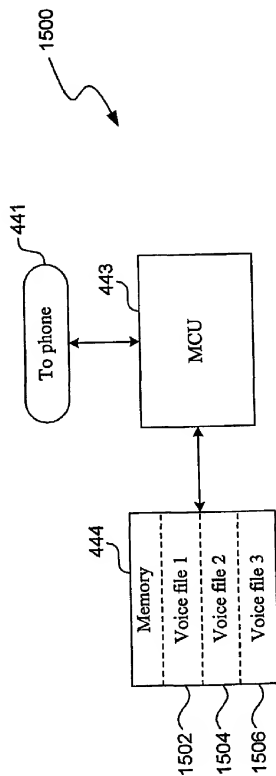
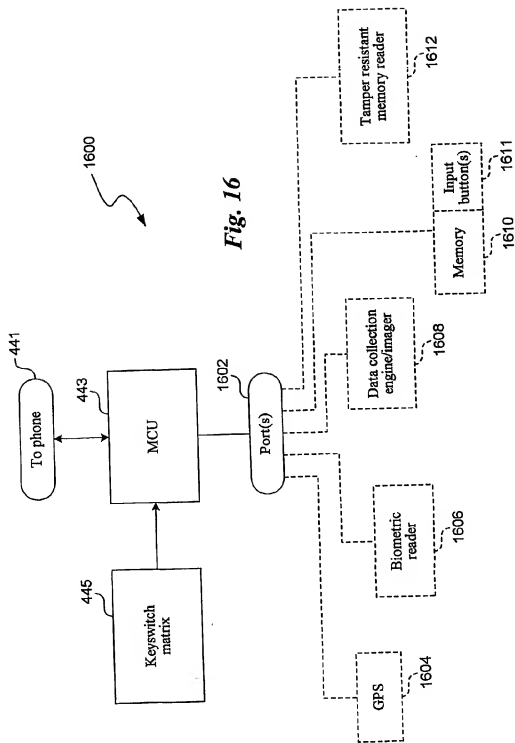


Fig. 15



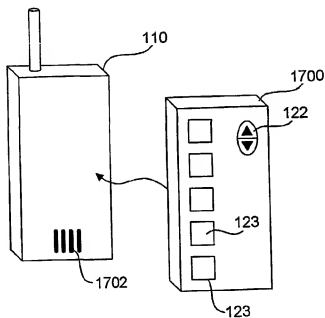


Fig. 17

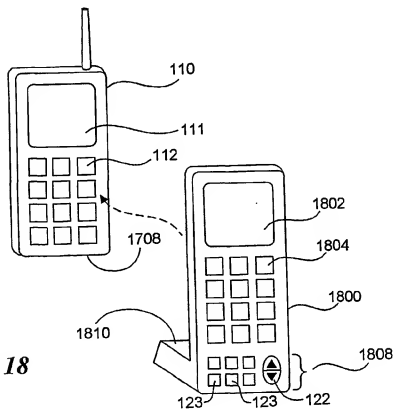
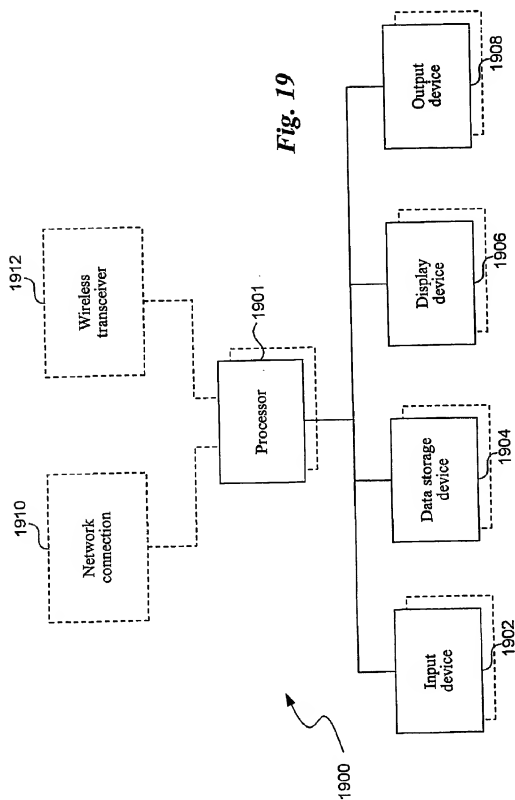
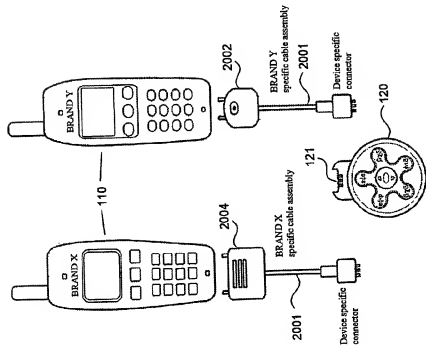


Fig. 18



cables & connectors



- The device can have a small interface connector. It can either be built into the device at one end or have a cable attached with it.
- Varying adaptor connectors need to be made available to connect to varying handsets as in concept 2, but the interface between the two ends is relatively small.
- Increased NRE cost required for adaptor connector.
- Data connector and cable to seeker is an "off the shelf" item.
- Seeker interface connector is an "off the shelf" item.

Fig. 20

**NAVIGATION CONTROL UNIT FOR A WIRELESS
COMPUTER RESOURCE ACCESS DEVICE, SUCH
AS A WIRELESS WEB CONTENT ACCESS
DEVICE**

**CROSS-REFERENCE TO RELATED
APPLICATION**

[0001] This application claims the benefit of U.K. Patent Application No. GB 0009004.3, filed Apr. 13, 2000, currently pending.

TECHNICAL FIELD

[0002] The present disclosure relates in general to a navigation control unit for use with a wireless computer resource access device.

BACKGROUND

[0003] The Internet comprises a vast number of computers and computer networks interconnected through communication channels. The Internet is used for a variety of reasons, including electronic commerce, exchanging information such as electronic mail retrieving information and doing research, and the like. Many standards have been established for exchanging information over the Internet, such as electronic mail, Gopher, and the World Wide Web ("WWW"). The WWW service allows a server computer system (i.e., web server or website) to send graphical web pages of information to a remote client computer system. The remote client computer system can then display the web pages. Each resource (e.g., computer or web page) of the WWW is uniquely identifiable by a Uniform Resource Locator ("URL"). To view a specific web page, a client computer system specifies the URL for that web page in a request (e.g., a Hypertext Transfer Protocol ("HTTP") request). The request is forwarded to the web server that supports that web page. When that web server receives the request, it sends the requested web page to the client computer system. When the client computer system receives that web page, it typically displays the web page using a browser. A browser is typically a special-purpose application program for requesting and displaying web pages.

[0004] Currently, web pages are often defined using Hypertext Markup Language ("HTML"). HTML provides a standard set of tags that define how a web page is to be displayed. When a user makes a request to the browser to display a web page, the browser sends the request to the server computer system to transfer to the client computer system an HTML document that defines the web page. When the requested HTML document is received by the client computer system, the browser displays the web page as defined by the HTML document. The HTML document contains various tags that control the display of text graphics, controls, and other features. The HTML document may contain URLs of other web pages available on that server computer system or on other server computer systems.

[0005] New protocols exist, such as Extensible Markup Language ("XML") and Wireless Access Protocol ("WAP"). XML provides greater flexibility over HTML. WAP provides, among other things, the ability to view web pages over hand-held, wireless devices, such as cell phones and portable computers (e.g., PDA's).

[0006] Recently, portable communication devices such as mobile telephones have been developed to access information on a local or global computer network. These devices come in many different forms including, for example, mobile telephone or palm top computers, and will be referred to generally as wireless web access devices.

[0007] Customers of the wireless web access device desire to have devices that provide a large amount of functionality and yet are small, lightweight, and affordable. To accommodate these conflicting desires, manufacturers have made the user controls smaller and have designed each one to perform potentially a variety of functions. For example, many wireless web access devices require users to press a small button up to three times in order to input just one character. Moreover, users often have to navigate through a large number of websites or levels of websites, requiring a large number of often cumbersome inputs. Accordingly, it is desired to increase both the functionality and ease of use of wireless web access devices.

[0008] U.S. Pat. No. 5,854,624 to Grant, issued Dec. 29, 1998 ("Grant") discloses a pocket-sized user interface for accepting user input for a separate Internet browser terminal designed to, among other things, reduce carpal tunnel syndrome for people using traditional computer keyboards to browse the Internet on their personal computer. The user interface of Grant must be less than 0.45 inches in thickness and roughly the length, width, and shape of a standard credit card. The interface is connected to a browser terminal via a translator, which converts the commands to a form acceptable to the browser terminal, and the translator is preferably connected to both the browser terminal and the user interface with a cord. The buttons on Grant are programmed to provide linking commands to a variety of websites. The user interface of Grant, however, is plagued with problems. For example, the user interface Grant is severely limited in size, shape and functionality and requires the use of a translator. In addition, Grant only discloses buttons programmed on the user interface itself limiting its usefulness relative to the present invention. These are only some of the problems associated with Grant.

[0009] Most wireless web access device users are unsophisticated in the operation of such devices, and thus have difficulty reconfiguring them to select a new home page (if this is possible) or even access other web pages. Even if users are capable of operating the device, navigating to desired web pages can be difficult, often involving a complex string of key presses. Thus, users find it difficult to both customize their wireless web access devices and navigate to desired web pages. Furthermore, many of the wireless web access devices are not general purpose computing devices for browsing or web surfing, but instead are task driven for a small set of preferred tasks for the user. These tasks are horizontal across groups of people, such as electronic mail calendar, address book, and the like. Content on the world-wide web, however, is much more segmented to specific user groups interested in the particular content provided by a particular site. Thus, there is a discontinuity between wireless web access devices and the content to which they allow users access.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] FIG. 1 is schematic view of a wireless web access device with a first preferred embodiment of a navigation control unit.

[0011] FIG. 2 is a schematic view of a second preferred embodiment of the navigation control unit.

[0012] FIG. 3 is a schematic view of a third preferred embodiment of the navigation control unit.

[0013] FIG. 4 is a schematic view of a preferred control circuit of the navigation control unit.

[0014] FIG. 5 is a flowchart showing a preferred method of operation of the navigation control unit.

[0015] FIG. 6 is a flowchart showing a preferred method for providing higher-level functionality in the navigation control unit.

[0016] FIG. 7 is a digitized image of an example of a wireless web access device according to the third preferred embodiment of FIG. 3.

[0017] FIG. 8 is a front view of an alternative embodiment of the navigation control unit employing a thumb pad.

[0018] FIG. 9 is a front view of an alternative navigation control unit employing a thumb wheel.

[0019] FIG. 10 is a front view showing an alternative navigation control unit employing a touch sensitive LCD.

[0020] FIG. 11 is an alternative embodiment of the navigation control unit employing a touch sensitive screen.

[0021] FIG. 12 is a block diagram illustrating an alternative embodiment of the navigation control unit employing multi-colored light emitting elements and a battery.

[0022] FIG. 13 is a block diagram illustrating an alternative embodiment of the navigation control unit employing a key switch matrix disposed in separate housing coupled wirelessly to another portion connected to the wireless web access device.

[0023] FIG. 14 is a block diagram illustrating another alternative embodiment of the navigation control unit having a FM receiver, MP3 player, or both.

[0024] FIG. 15 is a block diagram illustrating another alternative embodiment of the navigation control unit for processing voice commands.

[0025] FIG. 16 is a block diagram illustrating another alternative embodiment to the navigation control unit having removable modules.

[0026] FIG. 17 is an isometric diagram illustrating an alternative embodiment of the navigation control unit disposed within a removable battery for the wireless web access device.

[0027] FIG. 18 is an isometric diagram illustrating another alternative embodiment of the navigation control unit as disposed in a removable face plate for the web access device.

[0028] FIG. 19 is a block diagram of a suitable computer for employing aspects of the invention.

[0029] FIG. 20 is a diagram illustrating an alternative embodiment employing a cable connector between the navigation control unit and the wireless device.

[0030] In the drawings, identical reference numbers identify identical or substantially similar elements or acts. To easily identify the discussion of any particular element or

act, the most significant digit or digits in a reference number refer to the Figure number in which that element is first introduced (e.g., element 1104 is first introduced and discussed with respect to FIG. 11).

[0031] The headings provided herein are for convenience only and do not necessarily affect the scope or meaning of the claimed invention.

DETAILED DESCRIPTION

[0032] The following description provides specific details for a thorough understanding of, and enabling description for, embodiments of the invention. However, one skilled in the art will understand that the invention may be practiced without these details. In other instances, well known structures and functions have not been shown or described in detail to avoid unnecessarily obscuring the description of the embodiments of the invention.

[0033] Depicted embodiments of the invention are intended for use with any suitable portable wireless web access device 110. By way of example, the preferred embodiments will be described with reference to a portable communication device such as a mobile telephone, Internet-enabled PDA, automobile-based web access device, or other portable or mobile communication devices. Suitably, the mobile telephone is a cellular telephone such as a Global System for Mobile Communications ("GSM") device, preferably operating under the wireless application protocol ("WAP"), General Packet Radio Service ("GPRS"), Third Generation Mobile System ("3G"), I-mode or similar communications protocol. The web access device 110 typically has a display screen 111 and integral user controls 112 which are suitably buttons such as membrane switches.

[0034] Under a communications protocol such as WAP, the web access device 110 is used to access a wide range of information on databases linked by a global computer network such as the Internet. The web access device 110 uses a browser function to access the Internet 115 through a gateway portal 114. Navigation between sites and between pages of a site is performed using the integral control buttons 112 to control a browser function of the web access device 110. Often it is desired to make the web access device 110 as small as possible and a problem arises in that the integral control buttons 112 become smaller and more difficult to operate. Further, it is desired to keep the number of user controls to a minimum for space and cost, but by contrast it is also desired to increase the number of functions available on the device. As a result, each integral control button 112 typically performs a number of different functions often operated by pressing the same button several times or by pressing control buttons in various different combinations. Often, a user must navigate a menu structure in order for the web access device to perform a desired function. It has been found that a menu structure having more than one or two levels is particularly difficult for users to navigate.

[0035] Referring to FIG. 1, a first embodiment provides a navigation control unit 120 that is coupleable to the wireless web access device 110. (The terms "wireless access device", "wireless device", "web access device", and similar terms are generally used interchangeably herein.) In this embodiment, the navigation control unit 120 is coupleable directly to the web access device 110 such as by a connector 121 entering a corresponding port 113 on the web access device

110. The connector 121 provides both electrical and mechanical coupling between the navigation control unit 120 and the web access device 110. The port 113 in this example is shown at the bottom of the web access device 110, but can be provided elsewhere on the device or remote therefrom such as on an adapter lead.

[0036] FIG. 2 shows a second embodiment wherein the navigation control unit 120 comprises a hands-free unit 230 including a microphone 231 and an earpiece 232. Suitably, the handsfree unit 230 is coupled to the navigation control unit 120 by a communication link such as a cord 233. Alternatively, a local wireless link is provided for communication between the navigation control unit 120 and the hands-free unit 230, such as by using optical, infrared, or radio frequency signals.

[0037] FIG. 3 shows a third embodiment where the navigation control unit 120 is provided remote from the wireless web access device 110 linked by a communication link such as a cord 324 or a local wireless link. Conveniently, in this embodiment the web access device 110 may be carried about a user's person such as in a pocket, the navigation control unit 120 may be carried separately such as in the hand, on a belt, or on a jacket lapel, and the handsfree unit 230 may be provided about the user's head.

[0038] Under an alternative embodiment (not shown), the hands-free unit 230 is omitted. As a result, the navigation control unit 120 is coupled to the web access device 110 by the cord 324 and provides the same benefits as those in the third embodiment.

[0039] Under another alternative embodiment, the navigation control unit 120 is embodied or incorporated within the wireless device 110. Under this alternative embodiment, the navigation control unit may be embodied as additional circuitry and hardware (including user input buttons) incorporated into the wireless device, and/or software stored in memory within the wireless device. Thus, the functionality and features described herein may be embodied directly within the wireless device.

[0040] The navigation control unit 120 provides at least one user control 122 and preferably, a plurality of user controls as illustrated. These user controls 122 on the navigation control unit 120 are remote from the integral control buttons 112 provided on the web access device 110. The user controls 122 may take any suitable form, such as keys formed (e.g., membrane switches). Further information regarding construction of the navigation control unit may be found in the U.S. patent application Ser. No. _____, entitled "Hardware Configuration For A Navigation Control Unit For A Wireless Computer Resource Access Device, Such As A Wireless Web Content Access Device," filed concurrently herewith.

[0041] Unless described otherwise herein, the construction and operation of the various blocks shown in FIGS. 1-3 and the other Figures are of conventional design. As a result, such blocks need not be described in further detail beyond that provided herein because they will be understood by those skilled in the relevant art. Such further detail is omitted for brevity and so as not to obscure the detailed description of the invention. Any modifications necessary to the blocks in FIG. 1 (or other Figures and embodiments) can be readily made by one skilled in the relevant art based on the detailed

description provided herein. Furthermore, much of the detailed description provided herein is explicitly disclosed in the above patent application. Most or all of the additional material of aspects of the invention will be well known to or recognized by those skilled in the relevant art as being inherent in the detailed description provided in such patent application. Those skilled in the relevant art can implement aspects of the invention based on FIGS. 1-3 and the detailed description provided in the above patent application.

[0042] FIG. 4 shows a suitable circuit construction for the navigation control unit 120. A first input/output ("i/o") port 441 communicates with the wireless web access device 110. In one example, the i/o port 441 uses an RS232 communications interface. Communications are governed by a protocol such as GSM07.07. Power, for example at +3.3V or +5V and GND, is drawn through the port 441 from the wireless web access device 110. Alternatively, an independent power source may be provided as part of the navigation control unit. The independent power source may be any suitable power source, including but not limited to batteries, solar-generated power, or power provided by another device, such as an automobile cigarette lighter, a wall outlet, or a power source associated with a personal computer. Suitably, audio signals are passed directly from the first i/o port 441 to a second i/o port 442. The second i/o port 442 is coupled to the handsfree unit 230.

[0043] The navigation control unit 120 comprises a microprocessor 443 for executing instructions stored on an internal or external memory such as an EPROM and coupled to internal or external storage or memory 444 such as SDRAM. The microprocessor is coupled to the user controls 122 such as through a keyswitch matrix 445. Further details regarding the circuit construction and alternatives are provided below.

[0044] Operation of the navigation control unit 120 will now be described with reference to a routine 500 shown in FIG. 5. Each of the blocks depicted in FIG. 5 and the other flowcharts is of a sub-operation type that is either well known in the art or may be implemented by those skilled in the relevant art based on the detailed description provided herein. Each block may well include a sequence of operations that need not be described herein. Those skilled in the relevant art can create source code, microcode, or otherwise implement the invention based on the flowchart of FIG. 5 and the detailed description provided herein for operating the navigation control unit. The routine 500 is preferably stored in non-volatile memory that forms part of the microprocessor 443 or memory 444, or can be stored in removable media, such as disks, or hardwired or preprogrammed in chips, such as EEPROM semiconductor chips. Those skilled in the relevant art will appreciate that some or all of the routine 500 and other functions and methods described herein can be performed by an application specific integrated circuit (ASIC) or a digital signal processing (DSP) integrated circuit through conventional programmed logic arrays or other circuit elements.

[0045] In block 501, the navigation control unit 120 is powered on, such as by the navigation control unit 120 being connected to the web access device 110 or by the web access device 110 being turned on. In block 502, communications with the web access device 110 are initialized. For example, communication settings such as baud rate are negotiated. An identify request may be sent to the web access device 110

and a reply received which gives identity information about the web access device **110** such as make and model information. If the identity information is not received or is not recognized, operation ends in block **503**.

[0046] In block **504**, the navigation control unit **120** optionally sets configuration parameters of the web access device **110** using configuration commands.

[0047] In block **505**, the navigation control unit **120** waits for user input such as by polling the keyswitch matrix **445**. In response, in block **506** the navigation control unit **120** sends control commands to the web access device **110**.

[0048] Operation continues until power to the navigation control unit **120** is removed, such as when the navigation control unit **120** is disconnected from the web access device **110** or when the web access device **110** is turned off.

[0049] The configuration commands in block **504** are used to set a wide variety of configuration parameters of the web access device **110**. The configuration parameters are determined by the nature and type of the web access device **110**. In the example of a GSM cellular device, the web access device **110** dials a predetermined network number when attempting to establish a connection to the Internet through a predetermined gateway portal. The gateway portal is one example of a configuration parameter that may be set by the navigation control unit **120**. Other configuration parameters may set screen displays including predetermined logos and advertising information to appear on the display screen **111**. Still other configuration parameters of the web access device **110** include, for example, a home page, bookmarks stored by the web access device **110**, and a ringing tone of the web access device **110**. The navigation control unit **120** conveniently sets these and other configuration parameters of the web access device **110** for the user automatically and requires minimal or even no user input. Advantageously, the user avoids complicated button press arrangements and menu structures in the web access device **110**. Also, where configuration parameters are sent over a live network connection, network bandwidth and network time is substantially reduced by the automatic operation of the navigation control unit **120** compared with manual keypresses of the integral control buttons **112**.

[0050] The commands sent by the navigation control unit **120** represent a keypress sequence equivalent to a sequence of manual keypresses on the integral user control buttons **112**. In the simplest example, each command sent to the web access device **110** is equivalent to a single press on one of the integral user control buttons **112**. In most practical examples, each command is a string representing a predetermined sequence of keypresses. The keypress representation is preferably determined with reference to the identity information obtained in block **502** such that the navigation control unit **120** is able to operate with a wide variety of web access devices **110**. Suitably, the keypress sequence is obtained with reference to a lookup table stored in the navigation control unit **120** such that each user control **122** maps to a plurality of stored keypress sequences and one of the keypress sequences is selected according to the identity information of the web access device **110**. The keypress sequence is then used to form the command or a sequence of commands, depending upon the communication protocol required for communication with the identified web access device **110**.

[0051] The user controls **122** monitored in block **505** perform any suitable function. The control commands sent in block **506** will now be described in more detail. A first group of the user controls **122** or keys represents the most commonly used navigation functions suitable for controlling the web access device **110** for navigation of a local or global computer network using commands such as back, forward, scroll up, scroll down, and select. This first group of keys may directly replicate equivalent control buttons **112** on the wireless web access device **110**. It is advantageous to provide these simple user controls on the navigation control unit **120**. In one embodiment, for example the keys of the navigation control unit **120** are easier to use than the integral control buttons **112** of the web access device **110** by being larger or having improved ergonomics.

[0052] Another group of the user controls **122** provides improved functionality over the integral control buttons **112**. This second group of controls performs higher level functions. The navigation control unit **120** may have only the first group, only the second group, or preferably, both groups of user controls **122**.

[0053] As described herein, one keypress on the user controls **122** of the navigation control unit **120** represents a plurality of button presses required to perform the equivalent function using the integral control buttons **112** of the web access device **110**. The controls may perform a wide variety of higher level functions depending on the nature and type of the web access device **110**.

[0054] As shown in FIG. 1, a selected one or more of the user controls **122** have pre-defined hot key controls **123**, each having an associated hot key function. The hot key controls **123** each command the web access device **110** to open a connection to a particular website. Each of these hot key controls **123** links to a predetermined site such that the user may easily access a selected few predetermined sites very conveniently. Advantageously, the user obtains access to these predetermined websites without having to use or even understand other navigation controls on the wireless web access device **110** or on the navigation control unit **120**.

[0055] FIG. 6, as a routine **600**, shows a preferred method for performing higher level controls such as the hot key function **123**. At block **601** a hot key **123** is activated by the user.

[0056] At block **602** the navigation control unit **120** sends control commands to the web access device **110**. These control commands may depend upon the current state of the web access device **110**, for example to establish a web connection or open a browser function if required. The control commands include sending a URL. Conveniently, the URL is sent as a keypress sequence.

[0057] In one example, the URL comprises three fields. A first field gives a web address, preferably in a standard format such as "http://www.serveraddress.xxx". A second field provides an identifier unique to the navigation control unit **120**, or unique to a predetermined group of navigation control units, such as an alphanumeric sequence of 6, 8 or 10 characters allocated to the navigation control unit **120** during manufacture. In this example, the unique identifier is "XXX12345". The third field identifies the hot key user control **123** activated by the user as determined in block **601**. In this example, the user activated key number "3". The

complete URL is sent, for example, as the character sequence "http://www.serveraddress.xx12345/3".

[0058] The URL may require a complicated keypress sequence. A web access device 110 may have integral control buttons 112 in a 4x3 number keypad layout where each number key is used to obtain an extended alphanumeric character set by repeated keypresses. For example, the "1" button is pressed twice to give the letter "A" or pressed three times to give the letter "B". Hence, entering the URL manually requires many keypresses on the integral control buttons 112. In the above example, the URL contains 39 characters, each of which may require several button presses by the user on the integral user controls 112—typically at least 60 presses. By contrast, the user need only perform one keypress on the hot key control 123 of the navigation control unit 120 to achieve the same result, giving a significant advantage.

[0059] In block 603, the web access device 110 responds to the URL and attempts to access the web address identified by the URL using browser functions within the web access device 110. The first field preferably identifies a predetermined navigation server 125 which receives the URL request from the web access device 110.

[0060] In block 604, the navigation server 125 uses the second and third fields of the URL to determine a redirection address and returns the redirection address to the web access device 110. At block 605, the web access device 110 is redirected to the redirection address supplied from the navigation server 125. The redirection address is a second URL.

[0061] The redirection address is conveniently determined with reference to a lookup table stored on the navigation server 125. In this example, the second and third fields provide the information "XXX12345/3" and the redirection address is returned as a website corresponding to hot key control number "3" on navigation control unit 120 number "XXX12345". The website may be visibly labeled on the hot key control 123 or adjacent thereto for the user. For example, the hot key control number "3" is labeled "weather" and the redirection address corresponds to a website giving weather information.

[0062] The redirection action takes place at the navigation server 125 such that the navigation control unit 120 is relatively dumb. Also, if the location of the desired website changes, or if it is desired to substitute another website, then reprogramming is performed centrally at the navigation server 125.

[0063] In a preferred embodiment, the navigation control unit 120 stores user specific information. Such information is delivered to the web access device 110, for example when accessing a particular predetermined website from one of the hot key controls 123. Additionally or alternatively, such user information is supplied from the navigation control unit 120 in response to an interrogation signal issued from the web access device 110.

[0064] In a typical wireless web access device 110, navigation generally takes place using software controls within the device. However, in the preferred embodiment of the present invention, the navigation control unit 120 provides an external hardware controller to determine navigation of the wireless web access device 110. The navigation control

unit 120 readily links to predetermined websites that are of interest to the user. The hot key controls 123 may be tailored to the needs of each user, such as providing financial, travel, sports or any other information, by changing the central lookup table or personalization table at the navigation server 125. The unique identifier allows each navigation control unit to have a different response based on the redirection addresses stored at the navigation server. Further information regarding navigation server operation and aspects of the navigation control unit may be found in the U.S. patent application Ser. Nos. _____ and _____, entitled "Software For A Navigation Control Unit For Use With A Wireless Computer Resource Access Device And Associated System" and "Navigation Server For Use With, For Example, A Wireless Web Access Device Having A Navigation Control Unit," filed concurrently herewith. Rather than employ a thin client, under an alternative embodiment, the navigation control unit, wireless web access device, or both, employ a fat clients whereby most or all of the functions described above are performed locally by the navigation control unit and/or wireless web access device. Thus, the wireless web access device need not contact the navigation server under this alternative embodiment, but instead accesses a pre-determined computer resource via a pre-programmed URL stored in the navigation control unit.

[0065] The navigation control unit 120 may take any suitable form factor. A generally rectangular box is shown in FIGS. 1, 2 and 3 merely for illustration. Likewise, the navigation control unit 120 may take any suitable size. In the first and second embodiments, at least the part of the navigation control unit 120 in the region of the connector 121 is sized and shaped to correspond with external contours of the web access device 110 in the region of the port 113, giving a neat visual appearance and assisting mechanical stability.

[0066] Referring to FIG. 7, an example of one external configuration for the navigation control unit 120 is shown as a unit 700. The unit includes a spring loaded clip 704 to permit a user to clip the cord 233 to the user's clothing. Each of the hot keys 123 includes a graphic depicting the website to which the hot key navigates, such as to an electronic mail site, to an Internet portal, or to other sites described herein. The user controls 122 correspond to up-and-down cursor buttons for navigating, such as within a web page displayed on the display screen 111, or backward and forward between previous and subsequent web pages. An enter, select or "OK" button 723 is provided to permit a user to enter or select a particular choice.

[0067] Now that one embodiment of the invention has been described in detail, various alternative embodiments will now be described. In general, alternatives and alternative embodiments described herein are substantially similar to previously described embodiments, and common elements and acts or steps are identified by the same reference numbers. Only significant differences in construction or operation are described in detail.

[0068] Referring to FIG. 8, an alternative navigation control unit is shown as a game playing unit 800. A thumb switch 802 dominates a central portion of the upper surface of the unit which allows a user to rapidly move along two axes, such as moving a game piece within the display screen 111. The user controls 122 correspond to functions common

on game device consoles or game controllers. The hot keys **123** correspond to links to websites for playing games, such as multi-player computer games. Thus, the unit **800** is specifically designed to allow a user to play WAP enabled games over a wireless network.

[0069] Referring to FIG. 9, an alternative navigation control unit is shown as a unit **900**. The unit **900** is similar to the unit **700** (FIG. 7) except that it includes a thumb wheel **902**. The thumb wheel **902** allows a user to quickly move a cursor or other object displayed on the display screen **111**. The unit **900** may further include a switch within the unit that is actuated by pressing the thumb wheel inwardly with respect to the housing of the unit. A back or enter/select button **902** is provided next to up and down the navigation buttons **906**.

[0070] The navigation control units **800** and **900** demonstrate additional types of user input devices that may be employed beyond simple buttons that a user depresses (as depicted in FIG. 3). Of course, any type of electromechanical transducer may be employed, such as a joystick, pressure sensitive switch, rocker switch, rotary pads, sliders, or other user input devices known by those skilled in the relevant art. As described herein, the user controls **122** may provide any kind of user input, including a request to link to a website, a scrolling or other control command, powering on or off, data entry, etc.

[0071] Referring to FIG. 10, an alternative navigation control unit **1000** is shown that employs a touch sensitive, liquid crystal display ("LCD") **1002**. The hot keys **123** and user controls **122** are displayed as "buttons" on the LCD **1002** that a user may select. A touch pad-type pointing device **1004**, although other types of pointing devices may be employed, such as trackballs and the like.

[0072] FIG. 11 shows an alternative to the unit **1000** as a navigation control unit **1100**. While the touch sensitive LCD **1000** has an ergonomic shape, the unit **1100** employs a generally rectangular touch sensitive LCD **1102** which may be more readily available and less expensive. The LCD **1102** includes an upper navigation portion that displays the hot keys **123** as icons, logos or pictograms. When the user or a third party changes a URL associated with one of the hot keys **123**, the navigation control unit **126** or navigation server **125** may provide instructions or display descriptions for displaying a different icon for the hot key with respect to the new website to which the hot key is directed.

[0073] Alternatively, or additionally, the LCD **1102** may be changed to correspond with the current function of a user control **122**. The function of each user control **122** in this embodiment would be designated by software instead of hardware. For example, the microprocessor may provide a browse signal to cause an appropriate browse button to be indicated on the LCD screen when a browser is being viewed on the wireless web access device **110**, while the microprocessor may provide a purchase signal to thereby indicate on the LCD screen a buy button when an e-commerce application is being viewed.

[0074] A display window **1106** displays content such as web pages (which may be similar to content displayed in the display screen). For example, the display window **1106** may display an advertisement from a retailer who is selling a product or service displayed in the display window as a

listing for a book of the month. A user control **122** is shown as a "Buy" button. In response to a user selecting the buy button, the navigation control unit instructs the navigation server **125** to place an order with the advertiser to purchase the displayed book. The navigation server provides the user's credit card number to the advertiser, where the credit card number is stored in a personalization table stored at the navigation server. Alternatively, the user's credit card number may be stored locally in the navigation control unit, or input manually by the user, and transmitted only when the user selects the buy button.

[0075] Of course, features such as the use of a buy button may be employed in any of the navigation control units described herein and need not be employed with a touch sensitive screen. For example, the user control **122** in another embodiment described herein could be configured as a "purchase" button and a command would be sent to an appropriate e-commerce web page requesting purchase of a product. A retailer could sell navigation control units **120** that contained a user control **122** programmed to purchase, say, the book-of-the-month and proceed to complete the e-commerce transaction based on payment and delivery information stored on a server. In an alternative embodiment, an electronic cash chip or e-wallet coupled with the navigation control unit **120** could be used to provide payment.

[0076] Referring to FIG. 12, another alternative embodiment shown as a navigation control unit **1200** replaces the touch sensitive LCD with one or more multicolored light emitting diodes (LEDs). The LEDs provide backlighting to graphics or images provided on an upper surface of the user controls to provide improved visibility. To compensate for additional power required by the LEDs, the navigation control unit **1200** includes a power supply such as a battery **1204**.

[0077] The LEDs **1202** change color depending upon the mode in which they are currently set. For example, the microprocessor **443** may command each LED to emit green light to illuminate associated user controls (e.g., buttons). If the user selects one of the user controls **122**, the microprocessor **443** commands that associated LED to emit yellow light, while the remaining user controls are illuminated with green light. The microprocessor **443** may furthermore command an LED to emit red light as a reminder to the user. For example, if one of the user controls is programmed as an email hot key for the user's email provider, the navigation control unit **1200** may receive a signal from the email provider indicating that the user has received new email messages. In response, the microprocessor **443** may command the LED for the email hot key to emit red light, as opposed to green light, to notify the user. Of course, various other options are available for assigning colors to associated functions, modes, or user alerts.

[0078] Referring to FIG. 13, another alternative embodiment is shown as a navigation system **1300** wherein the user controls **122** are remote from the wireless web access device **110**. The wireless web access device **110** is linked with the navigation system **1300** by a communications link such as a local wireless link, which includes radio, microwave, infrared, ultrasonic, and any other form of communication. Examples of local wireless link protocols include Bluetooth, Home RF, IEEE 802.11. In this wireless link embodiment, the maximum range is approximately 10 feet in order to

minimize operational requirements, but larger ranges are possible within the scope of the invention.

[0079] A first portion 1302 connects with the wireless web access device 110 and includes the microprocessor 443 and memory 444. This first portion also includes a wireless transceiver or receiver 1304 that communicates with another wireless transceiver or transmitter 1306 in a second, separate portion 1307. The second portion includes another microprocessor 1308 that includes on-chip memory 1310. The key switch matrix 445 is then coupled to the microprocessor 1308. As a result, a wire or cord need not connect the user controls with the web access device.

[0080] The first and second portions 1302 and 1307 are preferably enclosed within separate housings. The second portion may take any form, such as a pen, where the user controls are buttons along a barrel of the pen. In this embodiment, a hands-free unit 230 may be optionally coupled to the second portion 1307 by a communications link such as a cord 233 or local wireless link. The first portion for connecting to the wireless web access device may be sold independently of the separate portion and may include more expensive circuitry. Less expensive circuitry may be provided in the second portion 1307, and include, as stored in the memory 1310, a serial number or separate identifier associated with, for example, a media corporation.

The media corporation may then provide the second portion free as a promotional gateway to users. The navigation server then maps the user controls 122 of the second portion 1307 to one or more websites (or web pages of a single site) associated with the media corporation. Users may receive multiple second portions 1307, each associated with a particular company, market, hobby, interest, or content, as described herein.

[0081] In an alternative embodiment, the second portion 1307 takes the form of a wristwatch and includes a display 1320 for displaying time and/or other information. The display may be a standard LCD display and may be coupled to the microprocessor 1308. The second portion may provide numerous additional functions by combining additional functionality or elements described herein.

[0082] In another alternative embodiment, the second portion of 1307 takes the form of a remote control device. In this alternative embodiment, the wireless transceiver 1306 may be an infrared transmitter, or alternatively, a separate infrared transmitter may be provided. Thus, in this alternative, the second portion of 1307 may be used, for example, to control interactive TV, set-top boxes, Internet appliances, Internet enabled televisions or set-top boxes. Indeed, the wireless web access device 110 may be an interactive TV, set-top box, Internet appliance, Internet enabled television, or other network device coupled wirelessly or with wires to a network, such as the Internet. Thus, the second portion 1307 may be used both to redirect a browser on the interactive television or other network device to predetermined sites, as well as control functions of the interactive television, such as power, volume, channel selection, etc.

[0083] In yet another alternative embodiment, the second portion 1307 permits a user to access or communicate with a wireless Internet WAN. Thus, in this embodiment, the wireless transceiver 1306 may employ in wireless protocol employed by such wireless Internet WAN.

[0084] Referring to FIG. 14, an alternative navigation control unit 1400 is shown that includes additional circuitry

and associated functionality. An FM receiver 1402 is coupled to the microprocessor 443. The FM receiver allows a user to receive music or FM broadcasts and listen to them over the earpiece. While an FM receiver is depicted, other receivers may be employed, such as an AM receiver.

[0085] A solid-state music player, such as an MP3 player 1404, is also coupled to the microprocessor 443. The MP3 player 1404 allows the user to retrieve, decode, and play audio files, such as files stored in the memory 444 or retrieved via the wireless web access device 110. While an MP3 player is depicted, other known audio playback devices may be provided. Alternative embodiments employ only the FM receiver or MP3 player. Further alternative embodiments may employ other media players, such as still or moving (e.g. video) image players, such as JPEG, MPEG or DVD players.

[0086] Referring to FIG. 15, another alternative navigation control unit is shown as a unit 1500 that omits the key switch matrix 445. Instead, the microprocessor 443 and memory 444 are configured to process voice commands. Thus, a user may navigate to a desired website with the web access device 110 by speaking commands into a microphone associated with either the web access device or a separate microphone coupled to the microprocessor 443. The memory 444 includes several voice files associated with the user. For example three voice files 1502, 1504, and 1506 may store voice commands for certain preprogrammed URLs. A user, upon initializing the navigation control unit 1500, speaks the name of each of three websites previously programmed for the unit. The microprocessor 443, in turn, stores each of the spoken names in one of the voice files. Thereafter, when the user speaks one of the stored names into the microphone, the microprocessor accesses the navigation server to access, as described herein, a preprogrammed or pre-designated website associated with that name.

[0087] Referring to FIG. 16, an alternative navigation control unit 1600 permits reconfiguration of hardware components. The navigation control unit 1600 includes one or more ports 1602 that receive one or more optional modules for adding additional functionality to the navigation control unit. A global positioning system ("GPS") module 1604 provides positioning data that indicates where the navigation control unit is currently located. Such location information may be displayed on the display screen 111, possibly together with map data retrieved from the Internet 115. Alternative embodiments may omit the GPS module, and instead rely on other location determining methods, such as cell site triangulation, sector and power level determination, and other location determining methods known by those skilled in the relevant art. Such location determining information may be generated or received by the navigation control unit, and communicated to the wireless device, or vice versa.

[0088] A biometric reader module 1606 includes one or more biometric reading devices, such as tactile sensors (such as for fingerprint sensing), retinal imagers, voice fingerprint analyzers, or other biometric readers known by those skilled in the art. Such a biometric reader module may operate as a security device to prohibit authorized users from using a particular navigation control unit assigned to a particular user. Thus, unauthorized users may not employ the hot keys

and access websites associated with the hot keys (e.g., a website associated with the user's email inbox).

[0089] A data collection engine or imager module **1608** allows the navigation control unit **1600** to automatically collect data from data carriers such as bar codes, magnetic stripes, radio frequency identification tags (RFID tags), etc. The data collection engine module **1608** may take the form of any data collection device, such as a laser scanner, wand-type bar code reader, magnetic stripe reader, RFID reader, and like. If the data collection engine module is a magnetic stripe reader, the user may swipe his or her credit card through the reader to permit the navigation control unit to automatically capture the user's credit card number. The data collection engine module **1608** may also be a two-dimensional imager, such as a CCD camera.

[0090] The memory module **1610** allows the navigation control unit **1600** to accept removable and replaceable memory modules. The memory module may take any known form, such as PCMCIA cards, semiconductor chips with various packaging, floppy or hard disks, or other known memory devices, such as the memory stick manufactured by Sony. The memory module **1610** may be a Subscriber Identity Module ("SIM"). A SIM card includes a memory (and possibly associated processor) to encrypt voice and data transmissions, and identify a user on a mobile network has been a legitimate user. As a result, the SIM card module would permit access to a particular wireless network if the wireless device would otherwise be excluded from that network.

[0091] In one embodiment, the mobile device **110** may download from a server (such as the navigation server) software modules or additional functionality, which is stored in the memory of the navigation control unit. Alternatively, such additional software modules or added functionality may be stored in, or be provided by, the replaceable memory modules **1610**. Such additional functionality may include software games, simple arithmetic utilities (e.g., a present value calculator), additional URLs, and other functionality described in this in the applications cited herein. For example, such additional functionality could be applications designed to facilitate business, such as order taking, inventory control, expense tracking, or local corporate data storage. In an inventory control environment, the navigation control unit may employ a data collection engine, such as a laser scanner. Overall, the navigation control unit **1600** may employ two or more of the modules shown in FIG. 16, or other components or functions described herein.

[0092] One embodiment of the memory module **1610** may include one or more optional input buttons **1611** or user input devices. The memory stores a URL, redirect address or link, which may be accessed by the user depressing the input button **1611**. Thus, the user may plug the memory module **1610** into the navigation control unit to provide additional navigation capabilities for additional hot keys. Further information on this embodiment may be found in the U.S. patent application Ser. No. _____, entitled "Hardware Configuration For A Navigation Control Unit For A Wireless Computer Resource Access Device, Such As A Wireless Web Content Access Device."

[0093] A tamper resistant memory module **1612** allows the navigation control unit **1600** to accept tamper resistant memory devices, such as smart cards. Some smart cards

store encryption keys, electronic funds, or other important information. By providing the tamper resistant memory module **1612**, the navigation control unit **1600** can retrieve data from smart cards and provide appropriate access (in the case of encryption keys), facilitate electronic commerce (in the case of electronic funds), and the like. The tamper-resistant memory **1612** may form part of a Public Key Infrastructure ("PKI"), where the tamper-resistant memory and the navigation server share one or more public-private key pairs. As a result, the navigation control unit permits robust encryption. Many other modules are possible, such as modules for Bluetooth-enabled circuitry, removable chips, electronic cash devices, electronic commerce devices, electronic wallet devices, pagers, beepers, etc. The memory modules **1610** or **1612**, or the memory **444** of the navigation control unit itself, may store account information such as a user's credit card number to facilitate electronic commerce transactions or such information may be provided at the navigation server.

[0094] While the navigation control unit is generally described herein as being a separate device associated with the web access device (such as part of a hands-free headset of a cell phone), numerous other alternatives are possible. Referring to FIG. 17, an alternative embodiment combines the navigation control unit with a rechargeable battery **1700**. The rechargeable battery includes the user controls **122** and hot keys **123** provided on an outer surface of the battery. The battery **1700** is of a size and shape for securing to the web access device and connects to control signal terminals **1702** provided on the web access device.

[0095] In another alternative embodiment, the navigation control unit operates as a component in a house arrest or security device. Thus, the navigation control unit **1600** (alone or together with the wireless Web access device) is secured to or carried by an individual. The navigation control unit may include the GPS module to determine the location of the individual, although other embodiments may employ other means for locating the individual. Information regarding a location of the individual may be relayed wirelessly over a network to a central computer (such as the navigation server), which can track and monitor a location of the individual throughout the day to ensure that the individual complies with a predetermined plan.

[0096] Referring to FIG. 18, the navigation control unit is combined with a removable face plate **1800** that secures to the web access device **110**. The face plate **1800** includes a window **1802** and button portions **1804** that align or coincide with the display screen **1100** and integral control buttons **112**, respectively. Where a standard front face of the web access device fails to provide sufficient room to accommodate the user controls **122** and hot keys **123**, an additional portion **1808** may be provided, which is shown as extending below the web access device. Terminals **1810** couple to be control signal terminals **1702** when the face plate **1800** is secured to the web access device.

[0097] The navigation control unit **125** may be incorporated into any removable or replaceable element for a wireless web access device **110**. For example, the navigation control unit **125** may be configured within a replaceable antenna of a mobile phone. The navigation control unit may be employed with any Internet enabled device, such as wireless devices, and permits reprogramming or "macro-

like" programming of user controls or keys to permit users to perform actions or functions permitted by the Internet enabled device where such actions often require multiple key presses or user input actions on the Internet enabled device.

[0098] The navigation control unit **125** may be configured for particular vertical markets, industries, hobbies, or interests of groups of users. Thus, an organization may target a particular market segment of users and preprogram the hot keys to access only desired content over a network (and possibly permit the user to reprogram a subset of the user controls). Furthermore, the navigation control unit may include additional functionality depending upon the particular vertical market to which the device is to be used. For example, if the navigation control unit is to be employed by a corporation executive, then the hot keys may be programmed to access the executive's corporate email inbox, a corporate scheduling system, the corporate intranet, and the corporate extranet. The navigation control unit may also include the biometric reader module **1606** or tamper resistant memory module **1612** to provide a security measure that prohibits unauthorized users from accessing the executive's sites programmed by the hot keys.

[0099] While aspects of the invention are generally described herein for use with a web access device such as a cell phone, aspects of the invention may be employed with other computer system configurations including Internet appliances, hand-held devices, wearable computers, mobile phone devices, multiprocessor systems, microprocessor-based or programmable consumer electronics, set-top boxes, network PCs, mini-computers, mainframe computers, and the like. The invention can be embodied in a special purpose computer or data processor that is specifically programmed, configured, or constructed to perform one or more of the computer-executable instructions explained in detail below. Indeed, the term "computer", as used generally herein, refers to any of the above devices, as well as to any data processor.

[0100] The invention can also be practiced in distributed computing environments where tasks or modules are performed by remote processing devices and which are linked through a communications network, such as a Local Area Network ("LAN"), Wide Area Network ("WAN") or the Internet. In a distributed computing environment, program modules or sub-routines may be located in both local and remote memory storage devices. Aspects of the invention described below may be stored or distributed on computer-readable media including magnetic and optically readable and removable computer discs stored as firmware in chips (e.g., EEPROM chips), as well as distributed electronically over the Internet or over other networks (including wireless networks). Those skilled in the relevant art will recognize that portions of the invention may reside on a server computer while corresponding portions reside on a client computer. Data structures and transmission of data particular to aspects of the invention are also encompassed within the scope of the invention.

[0101] Referring to **FIG. 19**, one embodiment of the invention employs a computer **1900**, such as a personal computer or workstation, having one or more processors **1901** coupled to one or more user input devices **1902** and data storage devices **1904**. The computer is also coupled to at least one output device such as a display device **1906** and

one or more optional additional output devices **1908** (e.g., printer, plotter, speakers, tactile or olfactory output devices, etc.). The computer may be coupled to external computers, such as via an optional network connection **1910**, a wireless transceiver **1912**, or both.

[0102] The input devices **1902** may include a keyboard and/or a pointing device such as a mouse. Other input devices are possible, such as a microphone, joystick, pen, game pad, scanner, digital camera, video camera, and the like. The data storage devices **1904** may include any type of computer-readable media that can store data accessible by the computer **1900**, such as magnetic hard and floppy disk drives, optical disk drives, magnetic cassettes, tape drives, flash memory cards, digital video disks (DVDs), Bernoulli cartridges, RAMs, ROMs, smart cards, etc. Indeed, any medium for storing or transmitting computer-readable instructions and data may be employed, including a connection port to a network such as a local area network (LAN), wide area network (WAN), or the Internet (not shown in **FIG. 1**).

[0103] Referring to **FIG. 20**, and alternative embodiment employs an interface connector **2001** that includes plugs at each end, one that couples to the navigation control unit **120**, and another that operates as an interface plug for the wireless device **110**. A first interface connector **2001** includes an adapter **2002** to connect with a command terminal or socket associated with a first type of wireless device **110**. The first adapter **2002** may include memory for re-programming or initializing the first type of wireless device, as described herein, such as with respect to **FIG. 5**. Likewise, the second interface connector **2001** includes an adapter **2004** to connect with a command terminal or port associated with a second type of wireless device **110**. Again, the adapter **2004** may include memory for reprogramming or customizing the second wireless device.

[0104] Unless the context clearly requires otherwise, throughout the description and the claims, the words "comprise," "comprising," and the like are to be construed in an inclusive sense as opposed to an exclusive or exhaustive sense; that is to say, in a sense of "including, but not limited to." Words using the singular or plural number also include the plural or singular number, respectively. Additionally, the words "herein," "above," "below," and words of similar import, when used in this application, shall refer to this application as a whole and not to any particular portions of this application.

[0105] The above description of illustrated embodiments of the invention is not intended to be exhaustive or to limit the invention to the precise form disclosed. While specific embodiments of, and examples for, the invention are described herein for illustrative purposes, various equivalent modifications are possible within the scope of the invention, as those skilled in the relevant art will recognize. The teachings of the invention provided herein can be applied to other systems, not necessarily for the web-based system generally described above. For example, the navigation control unit may be used to access content or information stored on a LAN, access different pages of a single site on a network, or even access resources of a single stand-alone computer. Thus, under an alternative embodiment, the navigation control unit and hot keys may be configured to access only certain pages of content or resources available from a

single stand-alone computer. The elements and acts of the various embodiments described above can be combined to provide further embodiments.

[0106] All of the above references and U.S. patents and applications are incorporated herein by reference. Aspects of the invention can be modified, if necessary, to employ the systems, functions and concepts of the various patents and applications described above to provide yet further embodiments of the invention.

[0107] These and other changes can be made to the invention in light of the above detailed description. In general, in the following claims, the terms used should not be construed to limit the invention to the specific embodiments disclosed in the specification and the claims, but should be construed to include all media delivery systems that operate under the claims to provide a method for providing link character streams with associated aural content. Accordingly, the invention is not limited by the disclosure, but instead, the scope of the invention is to be determined entirely by the claims.

[0108] While certain aspects of the invention are presented below in certain claim forms, the inventors contemplate the various aspects of the invention in any number of claim forms. For example, while only one aspect of the invention is recited as embodied in a computer-readable medium, other aspects may likewise be embodied in a computer-readable medium. Accordingly, the inventors reserve the right to add additional claims after filing the application to pursue such additional claim forms for other aspects of the invention.

We claim:

1. An apparatus for providing access to web content from the Internet, the apparatus comprising:

- a mobile phone configured for communicating wirelessly with the Internet, wherein the mobile phone includes a browser and a display screen;
- a web navigation control unit coupled to the mobile phone, wherein the web navigation control unit comprises:
 - an interface configured for coupling with the mobile phone;
 - two or more user input buttons; and
 - circuitry including a processor, wherein the circuitry is coupled to the interface and to the user input buttons, and wherein the circuitry is configured to:
 - generate and transmit to the mobile phone a user command based on actuation of one of the buttons, wherein the user command includes an identification of the one button actuated, an identification of the navigation control unit and a URI; and

wherein, based on the URI, the mobile phone:

transmits the user command to a navigation server coupled to the Internet;

receives a redirection command from the navigation server based on the identification of the one button actuated and the identification of the navigation control

unit, wherein the redirection command includes an address of a web page on the Internet; and

accesses the address specified in the redirection command using the browser and retrieves the web page for display on the display screen.

2. The apparatus of claim 1, further comprising:

- a hands free headset having a microphone and ear piece;
- an electrical cord coupling the hands free headset and the navigation control unit to the mobile phone; and
- a semiconductor memory coupled to the microprocessor, wherein the memory stores at least the identification of the navigation control unit and the URI;

wherein the user input buttons include:

- a first set of navigation buttons for automatically navigating to a first set of predetermined web pages, wherein the first set of predetermined web pages are not determined by the user;
- a second set of navigation buttons for automatically navigating to a second set of predetermined web pages, wherein the second set of predetermined web pages are preprogrammed by the user; and
- a third set of navigation buttons for receiving user commands to move within the web page or between web pages.

3. The apparatus of claim 1, further comprising:

- a port for receiving an added functionality module, wherein the port electrically couples the added functionality module with the circuitry for communication therewith, and wherein the added functionality module is: a display screen, a touch-sensitive screen, two or more multicolored lights, a battery, a solar cell, a local wireless transceiver, an FM receiver, an MP3 player, a voice recognition module, a global positioning system module, a biometric reader, a data collection engine, a digital camera, expanded memory or tamper-resistant memory.

4. An apparatus for connection with a mobile wireless computer resource access device, the apparatus comprising:

a navigation control unit comprising:

- a communication interface configured for releasably securing at least a portion of the navigation control unit with the mobile wireless computer resource access device and for providing signal communication from the navigation control unit to the wireless computer resource access device;

user controls for providing user-input signals; and

circuitry including a processor and memory, wherein the circuitry is coupled to the interface and to the user controls, and wherein the circuitry is configured to:

- generate a computer resource access command based on user operation of the user controls,

transmit the computer resource access command to the wireless computer resource access device, and

wherein the computer resource access command includes a URL stored in the memory.

5. The apparatus of claim 4 wherein the mobile wireless computer resource access device includes a mobile phone, wherein the mobile phone includes a browser for accessing computer resources from the Internet, wherein the computer resources include web pages, wherein the user controls include a keyswitch matrix, and wherein the navigation control unit further comprises:

a hands free headset having a microphone and ear piece; and

an electrical cord coupling the hands free headset and the navigation control unit to the mobile phone.

6. The apparatus of claim 4 wherein the mobile wireless computer resource access device includes a mobile phone, wherein the mobile phone includes a browser for accessing computer resources from the Internet, wherein the computer resources include web pages, wherein the mobile phone is programmed to automatically access a predetermined web site, and wherein the circuitry is further configured to:

automatically initialize the mobile phone and reprogram the predetermined web site to an alternative web site.

7. The apparatus of claim 4 wherein the user controls comprise:

a first set of navigation buttons for automatically navigating to a first set of predetermined web pages, wherein the first set of predetermined web pages are not determined by a user;

a second set of navigation buttons for automatically navigating to a second set of predetermined web pages, wherein the second set of predetermined web pages are selectable by the user; and

a third set of navigation buttons for receiving user commands to move within a web page or between web pages.

8. The apparatus of claim 4, further comprising:

an audio signal source coupled to the circuitry for providing two or more user selectable audible signals, and wherein the mobile wireless computer resource access device includes a mobile phone that provides audible signals different from the two or more user selectable audible signals.

9. The apparatus of claim 4 wherein the navigation control unit is at least partially retained within an antenna, face-plate or rechargeable battery, and wherein the antenna, face-plate and rechargeable battery are connectable and user removable with respect to the mobile wireless computer resource access device.

10. An apparatus for a mobile wireless computer resource access device for accessing at least one computer resource via a network, the apparatus comprising:

a microprocessor coupled to communicate with the mobile wireless computer resource access device, wherein the microprocessor is user removable with

respect to the mobile wireless computer resource access device;

user input circuitry coupled to the microprocessor;

memory coupled to the microprocessor, wherein the memory stores

information identifying the apparatus and

at least one network address for the computer resource, and

wherein the microprocessor is configured to

process user input signals received from the user input circuitry and

command the mobile wireless computer resource access device to access the computer resource from the network based on the network address stored in the memory and the user input signals.

11. The apparatus of claim 10 wherein the memory is monolithically integrated with the microprocessor.

12. The apparatus of claim 10 wherein the mobile wireless computer resource access device is programmed to automatically access a predetermined computer resource, and wherein the microprocessor is further configured to:

automatically reprogram the mobile wireless computer resource access device to access an alternative computer resource.

13. The apparatus of claim 10, further comprising a battery coupled to the microprocessor.

14. The apparatus of claim 10, further comprising a solar cell coupled to the microprocessor.

15. The apparatus of claim 10, further comprising a removable power source coupled to the microprocessor.

16. The apparatus of claim 10 wherein the user input circuitry includes a first set of navigation buttons for automatically navigating to a first set of predetermined computer resources, wherein the first set of predetermined computer resources are not determined by a user.

17. The apparatus of claim 10 wherein the user input circuitry includes a second set of navigation buttons for automatically navigating to a second set of predetermined computer resources, wherein the second set of predetermined computer resources are selectable by the user.

18. The apparatus of claim 10 wherein the user input circuitry includes a third set of navigation buttons for receiving user commands to move within a web page or between web pages.

19. The apparatus of claim 10 wherein the user input circuitry includes a thumb pad switch.

20. The apparatus of claim 10 wherein the user input circuitry includes a thumb wheel.

21. The apparatus of claim 10, further comprising a liquid crystal display ("LCD") screen coupled to the microprocessor, wherein the LCD differs from a display of the mobile wireless computer resource access device.

22. The apparatus of claim 10 wherein the user input circuitry includes a touch-sensitive display coupled to the microprocessor, wherein the touch-sensitive display differs from a display of the mobile wireless computer resource access device.

23. The apparatus of claim 10 wherein computer resource is an electronic commerce web site, and wherein the user

input circuitry includes a buy button to automatically purchase a product or service from web site.

24. The apparatus of claim 10 wherein the user input circuitry includes at least one light emitting element for emitting light of first and second colors, and wherein the microprocessor provides a first signal to the light emitting element for emitting light of the first color in a first mode of operation for the apparatus, and provides a second signal to the light emitting element for emitting light of the second color in a second mode of operation for the apparatus.

25. The apparatus of claim 10, further comprising first and second separate housings, wherein the first housing at least partially secures the microprocessor and a wireless receiver, wherein the microprocessor is coupled to the wireless receiver, and

wherein the second housing at least partially secures the user input circuitry and a wireless transmitter for transmitting the input signals to microprocessor via the wireless receiver.

26. The apparatus of claim 10 wherein the user input circuitry is configured for transmitting the input signals to microprocessor via a local wireless link, and wherein the wireless link is a radio frequency, ultrasound or infrared link.

27. The apparatus of claim 10, further comprising first and second separate housings, wherein the first housing at least partially secures the microprocessor and a wireless receiver, wherein the microprocessor is coupled to the wireless receiver, and

wherein the second housing at least partially secures the user input circuitry and a wireless transmitter for transmitting the input signals to microprocessor via the wireless receiver, and wherein the second housing is shaped like a pen.

28. The apparatus of claim 10, further comprising first and second separate housings, wherein the first housing at least partially secures the microprocessor and a wireless receiver, wherein the microprocessor is coupled to the wireless receiver, and

wherein the second housing at least partially secures the user input circuitry, a display, clock circuitry and a wireless transmitter, wherein the transmitter is configured for transmitting the input signals to microprocessor via the wireless receiver, and wherein the second housing is shaped like a wristwatch.

29. The apparatus of claim 10, further comprising an FM receiver.

30. The apparatus of claim 10, further comprising a stored audio decoder coupled to the microprocessor for decoding stored audio for playback to a user.

31. The apparatus of claim 10 wherein the user input circuitry comprises voice commands for receiving spoken user input and generating the user input signals.

32. The apparatus of claim 10, further comprising a port for receiving a user-removable added functionality module, wherein the port electrically couples the added functionality module with the microprocessor for communication therewith.

33. The apparatus of claim 10, further comprising location determining circuitry.

34. The apparatus of claim 10, further comprising a tactile sensor coupled to the microprocessor for receiving tactile input signals.

35. The apparatus of claim 10 wherein the microprocessor is further configured to compare spoken user input to a stored voice fingerprint file stored in the memory.

36. The apparatus of claim 10, further comprising a CCD imager coupled to the microprocessor.

37. The apparatus of claim 10, further comprising a bar code reader coupled to the microprocessor.

38. The apparatus of claim 10, further comprising a port for receiving a tamper resistant memory module.

39. The apparatus of claim 10, further comprising a port for receiving a memory module.

40. The apparatus of claim 10 wherein the user input circuitry includes two or more buttons for automatically accessing two different pages of a single node on the network.

41. The apparatus of claim 10 wherein the microprocessor and memory are configured to access the computer resources of a single computer.

42. An apparatus for a mobile wireless computer resource access device for accessing at least one computer resource via a network, the apparatus comprising:

memory means for storing information identifying the apparatus and at least one network address for the computer resource;

user input means for receiving user input;

processing means, coupled to the memory and user input means, for processing user input and generating commands for the mobile wireless computer resource access device to access the computer resource from the network based on the network address stored in the memory and the user input; and

interface means, coupled between the processing means and the mobile wireless computer resource access device, for providing the commands to the mobile wireless computer resource access device.

43. A mobile phone apparatus for accessing at least one computer resource via a network the apparatus comprising:

a transceiver configured for communicating wirelessly with the network;

a microphone;

an audio output device;

user input buttons;

at least one hot key associated with a URI;

a visual display device; and

circuitry including memory and a microprocessor coupled to the transceiver, microphone, audio output device, user input buttons, hot key and the display device, wherein the memory stores the URI, and wherein the circuitry is configured to automatically generate an access command based on actuation of the hot key the URI and request, via the network, the computer resource.

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US006138036A

United States Patent [19]

O'Connide

[11] **Patent Number:** **6,138,036**
 [45] **Date of Patent:** **Oct. 24, 2000**

- [54] **WIRELESS TELEPHONE WITH VOICE DATA INTERFACE MODE**
 [75] Inventor: **Breannan O'Connide**, Celbridge, Ireland
 [73] Assignee: **Oki Telecom, Inc.**, Suwanee, Ga.
 [21] Appl. No.: **08/816,356**
 [22] Filed: **Mar. 13, 1997**
 [51] **Int. Cl.** **H04Q 7/20**
 [52] **U.S. Cl.** **455/557; 455/412; 455/414**
 [58] **Field of Search** **455/403, 412, 455/414, 417, 466, 550, 556, 557, 461, 379/90.02, 201, 210**

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[57] ABSTRACT

A wireless telephone is additionally operable in a voice data interface mode in which voice (sound) data is output from the wireless telephone for communication over a data network, such as, for example, the Internet. In the voice data interface mode, voice audio signals detected through a wireless telephone microphone are converted into data for transmission through the data network, and, likewise, voice data received by the wireless telephone from the data network, or sound data simply generated by a connected PC, is converted into audio signals and output through a wireless telephone speaker. In one embodiment, a wireless telephone with voice data interface functionality is serially connected as a peripheral device to a local PC which is also connected to an Internet service provider (ISP) through land lines, and in another embodiment, through the wireless telephone itself. Other embodiments include the wireless telephone connecting to the PC through a wireless link, and in others, connecting directly to an ISP. Storage of compressed digitized audio is also included for when communication of the voice data is not possible.

10 Claims, 5 Drawing Sheets

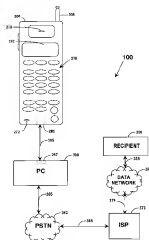


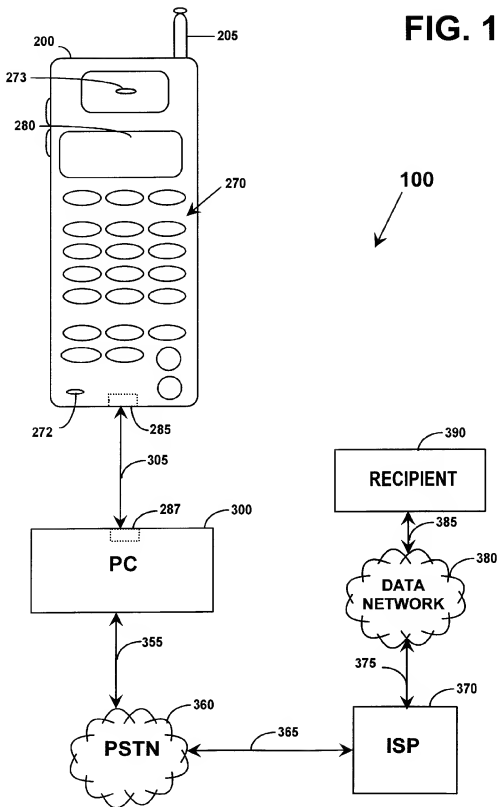
FIG. 1

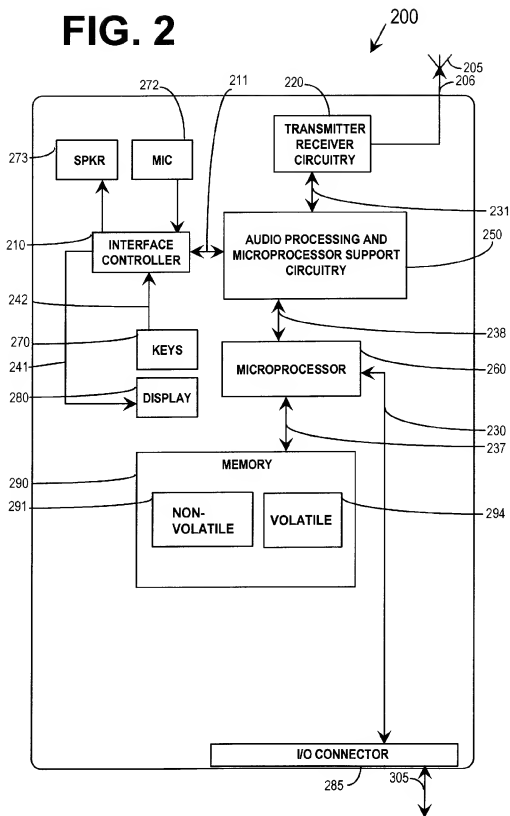
FIG. 2

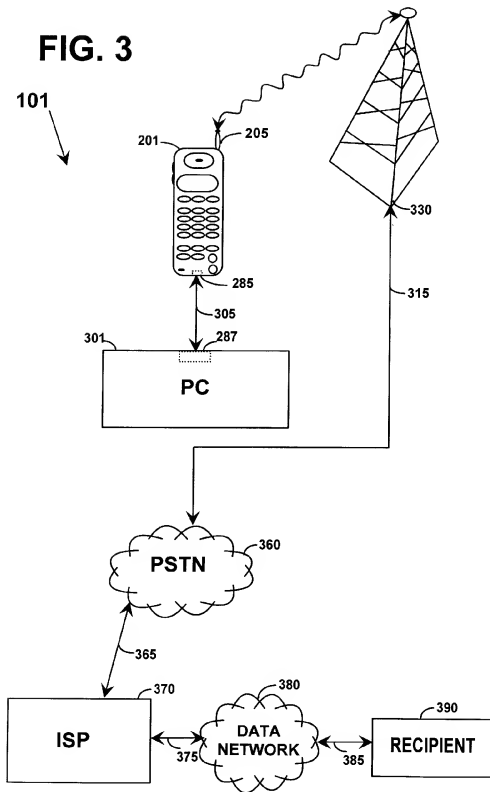
FIG. 3

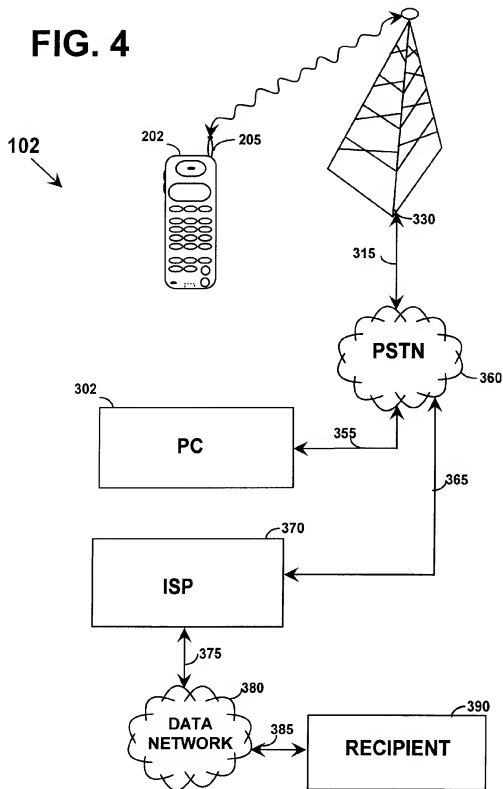
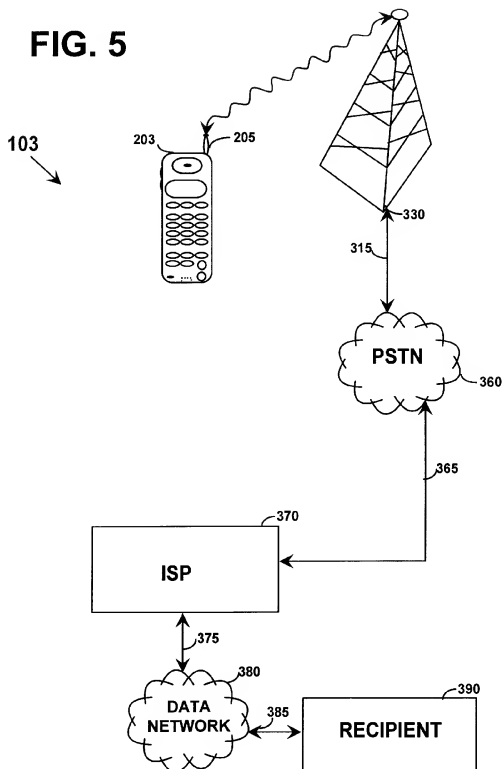
FIG. 4

FIG. 5

WIRELESS TELEPHONE WITH VOICE DATA INTERFACE MODE

BACKGROUND OF THE INVENTION

The present invention relates generally to the field of telecommunications, and more specifically, to the field of wireless telephone interface systems.

It is well known that personal computers, work stations, and mainframe computers may be used to send electronic mail (e-mail) messages (e.g., in the form of ASCII text) to destination electronic mailboxes, often through service providers with access to the Internet, LAN (local area network), or other data network. Voice-mail messaging systems, much like answering machines, are also well known, wherein a telephone caller's spoken message is transmitted to a destination voice-mail mailbox where it is recorded for later playback by a designated recipient having access to the voice-mail mailbox.

In addition to conventional telephones connected to the public switched telephone network (PSTN), there also exist data network telephones wherein two (or more) users having personal computers (PCs) with microphones, speakers and sound conversion capabilities connect to each other through a data network and exchange electronic voice signals to be heard by the respective users. These telephones are often termed Internet phones or I-phone systems when the data network involved is the Internet, and users often access the Internet through Internet Service Providers (ISPs). One problem with data network telephones is that users must agree to be available to connect to each other simultaneously to hear the voice signals. One additional problem is the limitation of inadequate microprocessor processing power on many PCs in compressing real time voice signals for transmission over bandwidth limited networks such as the Internet.

One conventional solution to these problems is a voice electronic mail (voice e-mail) system which converts user voice signals into data to be transmitted in an e-mail message. Unfortunately, both this system and the data network telephone system require additional hardware that many PCs don't include and are otherwise inconvenient to transport, e.g., sound conversion and microphone capabilities. In addition, the playback of audio sounds on a PC speaker, especially a voice e-mail message, is often socially inappropriate in many quiet or public environments.

There is, therefore, a need in the industry for a system for addressing these and other related and unrelated problems.

SUMMARY OF THE INVENTION

The present invention includes a fully-functional wireless telephone which is additionally operable in a voice data interface mode in which voice data is output from the wireless telephone for communication over a data network, such as, for example, the Internet. Voice e-mail and data network telephone applications are two example implementations of the present invention. In the voice data interface mode, voice audio signals detected through a wireless telephone microphone are converted into data for transmission through the data network, and, likewise, voice data received by the wireless telephone from the data network is converted into audio signals and output through a wireless telephone speaker.

According to a first preferred embodiment of the present invention, a telecommunications system includes a wireless telephone with voice data interface functionality locally

connected as a peripheral device to a PC. The connection between the wireless telephone and the PC is accomplished through, as one example, a serial input/output (I/O) port on the wireless telephone and a serial I/O port on the PC. Other embodiments include alternate ways of locally connecting the wireless telephone to the PC, including parallel connections or local wireless connections. In one implementation of either an Internet voice e-mail application or a data network telephone application, a user causes the wireless telephone to enter a voice data interface mode of operation and readies the PC to receive data through the serial I/O port connected to the wireless telephone. Once the wireless telephone is in the voice data interface mode, as the user speaks voice sounds into the wireless telephone, or subjects the wireless telephone to other sounds, the sounds are detected by the wireless telephone microphone and then digitized and compressed by the wireless telephone before being sent through the I/O port of the wireless telephone to the PC. In another implementation, such as for a voice e-mail application, the wireless telephone first stores voice data inside the wireless telephone until a transfer through the I/O port is possible. In such an implementation, the PC need not be ready to receive the data, and, furthermore, the wireless telephone need not even be connected to the PC when the user desires to record voice data.

When the PC receives the voice data, the data is transformed by the PC, as directed by the user, into, in the case of a voice e-mail application, a formatted text e-mail message, and a destination e-mail mailbox address selected by the user is attached to that formatted text e-mail message. The PC then conventionally transmits the e-mail message through the Internet to the destination e-mail mailbox using a connected PC modem communicating through a conventional land line telephone line with an Internet Service Provider (ISP). Likewise, when the user receives a e-mail message containing voice (sound) data (a voice e-mail message) after checking an e-mail mailbox, the user can direct the voice data to be serially output from the PC to the wireless telephone in the voice data interface mode where the voice data received by the wireless telephone is converted into audio signals and output through the wireless telephone speaker, in a private manner. Of course, in a data network telephone implementation, the wireless telephone serves as a private, effective and readily portable substitute for the microphone, speaker and sound conversion components of conventional data network telephone systems such that data is transferred, real-time, back and forth between the PC and the wireless telephone.

A second preferred embodiment of the present invention is similar to the first preferred embodiment except that the PC is not connected to a conventional land line telephone line which would otherwise provide a connection through the public switched telephone network (PSTN) to the data network, such as the Internet. Instead, the wireless telephone itself also provides a wireless link from the PC to the PSTN. According to this second embodiment, when the wireless telephone exits the voice data interface mode, it returns to function as a wireless telephone providing a wireless link to the PSTN for the connected PC. In other embodiments of the present invention, wireless telephones provide for more simultaneous operation in both the voice data interface mode and the conventional wireless telephone communication mode such that a real time wireless Internet telephone function is accomplished.

A third embodiment of the present invention is similar to the first embodiment of the present invention except that the wireless telephone wirelessly calls into the PC rather than

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being locally physically linked to the PC. One implementation of this embodiment includes a connection between a remote PC and the wireless telephone that extends through the PSTN, while other alternate implementations include a local wireless link. In the remote implementation, the PC acts as an intermediary by automatically accessing the ISP to communicate the voice data over the data network. In a store and forward application, such as a voice e-mail application, the PC only needs to include a single modem and a single telephone line connection, while in a real-time application, such as a data network telephone application, the PC needs to include multiple modem and land line connection functions.

A fourth preferred embodiment of the present invention includes a wireless telephone that also formats the voice data into a formatted text message and further provides the functionality provided by the PC in the first three preferred embodiments, i.e., the wireless telephone directly accesses the ISP through the PSTN. A recipient user's address (such as an e-mail mailbox for a voice e-mail implementation, and another type of address, i.e., a data network telephone "number", for a data network telephone implementation) is defined through manipulation of the wireless telephone keypad. Then, the wireless telephone directly accesses the ISP to upload and download voice data.

It is therefore an object of the present invention to eliminate the need for a personal computer microphone, speaker, and sound conversion functionality for voice communication over a data network by sharing these elements of a wireless telephone operable in a voice data interface mode.

Another object of the present invention is to leverage the inherent privacy and portability provided by a wireless telephone in the playback of audio data stored on a personal computer.

Another object of the present invention is to provide a wireless telephone voice data interface system.

Still another object of the present invention is to provide a wireless telephone having a voice data interface system for, in one embodiment, interfacing with a personal computer for sending and receiving voice data.

Yet another object of the present invention is to provide a wireless telephone operable in a voice data interface mode during which voice data is communicated, in one embodiment, through a serial input/output port on the wireless telephone.

Still another object of the present invention is to provide a wireless telephone operable in a voice data interface mode during which voice data is communicated, in one embodiment, directly with an ISP.

Yet another object of the present invention is to provide a personal computer peripheral including a microphone, a speaker, and voice conversion functionality which is further capable of wireless communication.

Other objects, features, and advantages of the present invention will become apparent upon reading and understanding the present specification, when taken in conjunction with accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block diagram representation of a telecommunications system including a wireless telephone with a voice data interface system connected to a PC as a peripheral device, in accordance with a first preferred embodiment of the present invention.

FIG. 2 is a block diagram representation of a telecommunications system including a wireless telephone with a

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voice data interface system connected to a PC as a peripheral device and as a wireless link to a PSTN, in accordance with a second preferred embodiment of the present invention.

FIG. 3 is a block diagram representation of a telecommunications system including a wireless telephone with a voice data interface system wirelessly connected to a PSTN for connection to a PC, which in turn connects to an ISP, in accordance with a third preferred embodiment of the present invention.

FIG. 4 is a block diagram representation of a telecommunications system including a wireless telephone with a voice data interface system wirelessly connected to a PSTN for direct connection to an ISP, in accordance with a fourth preferred embodiment of the present invention.

FIG. 5 is a block diagram representation of a wireless telephone with a voice data interface system of preferred embodiments of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Reference is now made to the drawings, wherein like reference numerals designate corresponding parts throughout the several Figures. Referring now to FIG. 1, a block diagram representation of a telecommunications system 100 is shown, in accordance with a first preferred embodiment of the present invention. A wireless telephone 200 with a voice data interface system is shown physically connected as a peripheral device to a personal computer (PC) 300 through a peripheral line 305 connected to a PC input/output (I/O) port 287, such as a serial port. Wireless telephone 200 includes, at least, a retractable antenna 205, an alphanumeric display 280, a keypad 270 with a voice interface mode key 271, a microphone 272, a speaker 273, and an I/O port 285. Wireless telephone 200 also includes internal circuitry which will be discussed in more detail below with reference to FIG. 5. A public switched telephone network (PSTN) 360 is also connected to the PC 300 through a local loop line 355, thus the PC 300 is understood to include a conventional modem and communications software. An Internet service provider (ISP) 370, as one example of a data network entry point, is connected to the PSTN 360 through a network line 365. A data network 380, such as the Internet, is connected to the ISP 370 through network connection 375 and to a recipient 390 through a network connection 385. Examples of the recipient 390 include an e-mail mailbox or a data network telephone, such as an Internet telephone. Of course, as would be understood by those reasonably skilled in the art of the present invention, lines 355, 365, 375, and 385, are conventional telecommunication connections, thus including physical links and other types of standard links.

FIG. 2 is a block diagram representation of the wireless telephone 200 with the voice data interface system, in accordance with the first preferred embodiment of the present invention. Modifications to the wireless telephone 200 that are necessary to accomplish other functions of the wireless telephones of other preferred embodiments of the present invention would be understood by those reasonably skilled in the art of the present invention after reading the discussion below. It should be understood that wireless telephone 200 is, in one implementation of the first preferred embodiment of the present invention, a code division multiple access (CDMA) digital cellular telephone. Of course, the scope of the present invention should be understood to include any type of wireless telephone, such as analog cellular telephones, time division multiple access (TDMA) digital telephones, 1.8 to 2.0 GHz personal communication systems (PCS), etc.

As voice signals, or other audio sounds, are received through the microphone 272, resulting analog signals are passed to an interface controller 210, which is connected through a connection 211 to audio processing and microprocessor support circuitry 250, which is connected to a microprocessor 260 through a connection 238. The speaker 273 is also connected to the interface controller 210, along with the keyboard 270 and display 280 through connections 242 and 241, respectively. Under direction from the microprocessor 260, as configured by memory 290, including both non-volatile memory 291 and volatile memory 294, circuitry 250 processes the microphone-received analog voice signals and includes, according to one implementation of the first preferred embodiment of the present invention, a coder/decoder (CODEC), a digital signal processor (DSP) functioning as a voice coder/decoder (VOCODER, or speech encoder/decoder), a CDMA modem, and an analog front end (AFE) for interfacing with transmitter receiver circuitry 220, which is connected to the antenna 205 through an antenna lead 206. The CODEC converts analog voice or speech (sound) signals to digital signals, for example, to pulse code modulated (PCM) digital signals. The DSP (VOCODER) receives the PCM speech samples and reduces the number of bits required to represent speech by exploiting the intrinsic properties of speech signals to reduce redundancy using a code excited linear prediction (CELP) method. On the receiver side, the DSP also performs Viterbi decoding for CDMA channel decoding.

While operating in a conventional transmission communication mode, the compressed signals from the VOCODER are convolutionally encoded for forward error correction, interleaved, CDMA channel encoded and converted to analog signals by the circuitry 250 prior to being mixed, filtered and modulated by transmitter receiver circuitry 220 and transmitted through antenna 205. When the wireless telephone 200 is operated in a voice data interface mode, after sounds are picked up by the microphone 272 and passed through the interface controller 210 to the circuitry 250, the detected sounds are digitized by the CODEC of circuitry 250 and then compressed by the VOCODER of circuitry 250 before being directed through the microprocessor 260 to external connector line 230, I/O connector 285, and peripheral line 305. According to alternate embodiments, forward error correction and error detection is also added. In the conventional reception communication mode of the first preferred embodiment of the present invention, received RF signals detected through antenna 205 follow a relatively similar, yet reversed, path to the speaker 273. Transmitter receiver circuitry 220 processes (demodulates, etc.) the received RF signals and passes the processed signals to the circuitry 250 for analog to digital conversion, CDMA channel decoding, de-interleaving, Viterbi decoded, etc.) before being sent to the DSP (VOCODER) and CODEC (not shown) of circuitry 250 for conversion to audio signals. On the other hand, while the portable wireless telephone 200 is operating in the voice data interface mode, vocoded digital sound signals received through the external connector line 230 are voice decoded and converted from digital to analog signals in the circuitry 250 before being output through the interface controller 210 and the speaker 273.

Of course, it should be understood that wireless telephone 200 also includes other components not specifically shown, such as a power manager which controls the supply of power and ground potential to various components and circuits of portable wireless telephone 200 such that separate types of power and grounding are available for digital circuits, analog and audio circuits, and RF circuits. A rechargeable

battery is also included in wireless telephone 200 which supplies portable power to wireless telephone 200 and is recharged through a charge control circuit. In addition, a charging connector is also included for receiving charging current from a charging accessory, such as a wall mounted transformer in certain embodiments.

Now, referring to both FIGS. 1 and 2, regarding specific operation of the voice data interface mode of the wireless telephone 200 of the telecommunications system 100 of FIG. 1, in accordance with the first preferred embodiment of the present invention, a user invokes the voice data interface mode by pressing a predefined key sequence on the keypad 270 or by instructing the PC 300 to invoke the voice data interface mode in the wireless telephone 200. Of course, different alternate embodiments of the present invention include each of these methods in isolation, while others include a dedicated key on the keypad 270. According to the first preferred embodiment of the present invention, after confirmation handshaking between the PC 300 and the wireless telephone 200, the voice data interface mode is officially entered by the wireless telephone 200. However, the wireless telephone 200 is still available to receive incoming telephone calls, the detection of which will immediately end the voice data interface mode.

After entering the voice data interface mode, if the users speaks, thus creating voice sounds, or subjects the wireless telephone 200 to another sound, the sound is detected by the microphone 272, and representative analog signals pass through the interface controller 210 before being converted to digitized sound by the CODEC and compressed by the VOCODER of circuitry 250. Subsequently, the digital signals are stored temporarily in volatile memory 294 of memory 290 before being output through I/O port 285. In alternate embodiments of the present invention, such storage lasts for as long as power is available to the wireless telephone so that such recorded sound can be output later. The format of the data leaving the I/O port 285 is, according to the first preferred embodiment of the present invention, ASCII text. Conversion to standard text format involves organizing bits of the stored compressed digitized sound in, for example, 7 bit ASCII character format with added bits (e.g., a parity bit, and start and stop bits) which are serially and asynchronously output through port 285 in conformance with the EIA/TIA 232-E standard. However, in other alternate embodiment systems, the compressed digitized data is sent instead as 8 bit binary data, i.e., as conventional data instead of, for example, 7 bit ASCII with added bits, or as a binary file attached to an e-mail message, as long as this data format is recognizable and retrievable in the alternate embodiment systems. Furthermore, basic PCM data and other formats are also contemplated.

After the PC 300 receives the data, according to the first preferred embodiment of the present invention, the compressed digitized data is transmitted from the PC 300, through the PSTN 360, ISP 370, and data network 380 to the recipient 390. In a voice Internet e-mail implementation, the compressed digitized data is included as text in a conventional e-mail message that is transmitted to a recipient e-mail address that is identified and designated by the PC 300 as directed by the user. On the receiving end, the recipient 390 is able to simply play the compressed digitized data of the voice e-mail message through a recipient PC (not shown) if capable of decompressing and converting the digitized signals into audio signals through a PC speaker; otherwise, a wireless telephone 200 receives the compressed digitized data and outputs the original sounds through the speaker 273

of the recipients wireless telephone 200 operating in the voice data interface mode. Similarly, in a data network telephone implementation, the compressed digitized data is forwarded to the recipient, as identified by the user during use of the PC 300, and similarly played back through a recipient PC or a recipient wireless telephone 200. Of course, rapid alternating between receiving and transmitting voice data is required of the wireless telephone 200.

FIG. 3 is a block diagram representation of a telecommunications system 101 including a wireless telephone 201 with a voice data interface system connected to a PC 301 as a peripheral device and as a wireless link to the PSTN 360 through a base station 330 and a network connection 315, in accordance with a second preferred embodiment of the present invention. As with the telecommunications system 100 (FIG. 1) of the first preferred embodiment of the present invention, an ISP 370 is connected through network line 365 to the PSTN 360 and through a network line 375 to a data network 380, which is connected through a network line 385 to a recipient 390. However, in addition to functioning as a voice data input and output peripheral for PC 301, wireless telephone 201, base station 330, and network connection 315 take the place of local loop line 355 of FIG. 1. Accordingly, in a voice e-mail implementation, after a user utilizes the wireless telephone 201 to generate a voice e-mail message in the PC 301, the wireless telephone 201 returns to operate in a conventional transmission communication mode so that PC 301 is able to access the ISP 370 through an initial wireless link provided by the wireless telephone 201. In one such embodiment, the PC 301 provides modem functionality and merely transmits regular modulated audio signals through the wireless telephone 201, while in other embodiments, the wireless telephone 201 provides the modem functionality so that the PC 301 simply transmits serial data through the connector 305, seeing the wireless telephone 201 as a modem. In a data network telephone implementation, the wireless telephone 201 is required to quickly alternate between data interface and conventional communication modes, as well as between transmit and receive modes.

FIG. 4 is a block diagram representation of a telecommunications system 102 including a wireless telephone 202 with a voice data interface system wirelessly connected to the PSTN 360 for connection to a PC 302, which in turn connects through the PSTN 360 to the ISP 370, in accordance with a third preferred embodiment of the present invention. Once again the base station 330 and network connection 315 provide a connection to the PSTN 360, and the ISP 370 is connected through network line 365 to the PSTN 360 and through a network line 375 to a data network 380, which is connected through a network line 385 to a recipient 390. According to this embodiment, the voice data interface mode is invoked after the wireless telephone 202 establishes a connection with the PC 302 by calling into the PC 302 and beginning data communications with the PC 302, which is thus required to be running auto-answer communication software capable of communicating with the PC 302. After the voice data interface mode is entered, voice data is received by the PC 302 (or transmitted from the PC 302 to the wireless telephone 202 if previously received). The PC 302 then automatically accesses the ISP 370 to communicate the voice data over the data network 380. In a store and forward application, such as a voice e-mail application, the PC 302 only needs to include a single modem and a single telephone line connection, while in a real-time application, such as a data network telephone application, the PC 302 needs to include multiple modem

and land line connection functions. The user manipulates the wireless telephone 202 to establish the identity of the recipient 390, which is also communicated to the PC 302. According to one implementation, alphanumeric addresses are stored in the wireless telephone 202, whereas other embodiments include simply designating one of a plurality of addresses stored in the PC 302. Of course, conventional e-mail broadcasting, responding and forwarding are also available.

FIG. 5 shows a block diagram representation of a telecommunications system 103 including a wireless telephone 203 with a voice data interface system wirelessly connected through the base station 330 and network connection 315 to the PSTN 360 and network connection 365 for direct (not through a PC) connection to the ISP 370, in accordance with a fourth preferred embodiment of the present invention. In this embodiment, functionality of PC 302 (FIG. 4) has, conceptually, been moved into the wireless telephone 203 or, in other embodiments, into the ISP 370. Accordingly, after entering the voice data interface mode, the wireless telephone 203 communicates directly with the ISP 370 to identify the recipient 390 and transmit compressed digitized data.

It is intended that the scope of the present invention also include various other embodiments besides those already described. Accordingly, it should be understood that each of the embodiments disclosed herein, including all the preferred embodiments, include features and characteristics which are considered independently inventive. Thus, the disclosure of variations and alterations of the preferred embodiments are intended only to reflect on the breath of the scope of the present invention without suggesting that any of the specific features and characteristics of the preferred embodiments are more obvious or less important.

Regarding specific application to the many inventive aspects of the present invention, a variety of environmental, economic, and other considerations are understood to contribute to the alteration or omission of selected inventive aspects. For example, although I/O port 285 conforms to the EIA/TIA-232-E standard, I/O port 285 may be a port with a bare minimum of control, signal, and communication lines (pins), as dictated by size and weight requirements of wireless telephone 200. Also, in certain embodiments it may be better in some circumstances to send voice e-mail messages as binary files attached to e-mail messages (created in PC 300) to e-mail mailboxes accepting voice e-mail messages.

The present invention is also useful in applications unrelated to communicating with a recipient. For environments or mechanical arrangements where playback through a PC speaker or recording with a PC microphone is unavailable or discouraged, a wireless telephone can be used as a peripheral for basic sound input and output functionality. Of course, in addition to or, in other embodiments, in the place of compressed digitized signals, depending on the type and purpose of the data being communicated, audio signals or PCM signals, are communicated through the I/O connector of the wireless telephone. In addition, besides communication through a data network accessible through the PSTN, use in other data networks is also contemplated, such as a local area network.

While the embodiments of the present invention which have been disclosed herein are the preferred forms, other embodiments of the present invention will suggest themselves to persons skilled in the art in view of the disclosure. Therefore it will be understood that variations and modifi-

cations can be effected within the spirit and scope of the invention and that the scope of the present invention should only be limited by the claims below. Furthermore, the corresponding structures, materials, acts, and equivalents of any means- or step-plus-function elements in the claims below are defined to include any structure, material, or acts for performing the functions in combination with other claimed elements as specifically claimed.

I claim:

1. A method of sending a voice electronic mail message to an electronic mailbox, the method comprising steps of:
coupling a wireless telephone to a personal computer;
detecting sounds through a microphone of the wireless telephone;
digitizing the detected sounds in the wireless telephone;
communicating the digitized detected sounds from the wireless telephone to the personal computer;
assembling in the personal computer the digitized detected sounds into an electronic mail message with an associated recipient electronic mailbox address; and
sending the electronic mail message to the recipient electronic mailbox.
2. The method as claimed in claim 1, further comprising a step of compressing the digitized detected sounds before being assembled in the electronic mail message.
3. The method as claimed in claim 1, wherein said sending step includes sending the electronic mail message to an Internet recipient electronic mailbox.

4. The method as claimed in claim 1, wherein said assembling step is accomplished by the wireless telephone and further includes a step of defining the recipient electronic mailbox address through manipulation of a keypad on the wireless telephone.

5. The method as claimed in claim 1, wherein said coupling step includes coupling through a local physical connection.

6. The method as claimed in claim 5, wherein said local physical connection includes a serial connection.

7. The method as claimed in claim 1, wherein said coupling step includes coupling through a local wireless connection.

8. The method as claimed in claim 1, wherein said coupling step includes coupling through a public switched telephone network.

9. The method as claimed in claim 1, wherein said sending step includes communicating from the personal computer, through the wireless telephone, to a public switched telephone network.

10. The method as claimed in claim 1, wherein said sending step includes communicating from the personal computer, directly through a land line connection, to a public switched telephone network.

* * * * *



US006148405A

United States Patent [19]**Liao et al.**[11] **Patent Number:** **6,148,405**[45] **Date of Patent:** **Nov. 14, 2000**

- [54] **METHOD AND SYSTEM FOR SECURE LIGHTWEIGHT TRANSACTIONS IN WIRELESS DATA NETWORKS**
- [75] Inventors: **Hanqing Liao**, San Ramon; **Stephen S. Boyle**, Fremont; **Peter F. King**, Half Moon Bay; **Bruce V. Schwartz**, San Mateo, all of Calif.
- [73] Assignee: **Phone.com, Inc.**, Redwood City, Calif.
- [21] Appl. No.: **08/966,988**
- [22] Filed: **Nov. 10, 1997**
- [51] **Int. Cl.** **H04N 7/67**
- [52] **U.S. Cl.** **713/201; 713/150; 713/170; 380/255; 380/278; 380/282**
- [58] **Field of Search** **713/201, 150, 713/168, 170; 380/255, 278, 282**
- [56] **References Cited**

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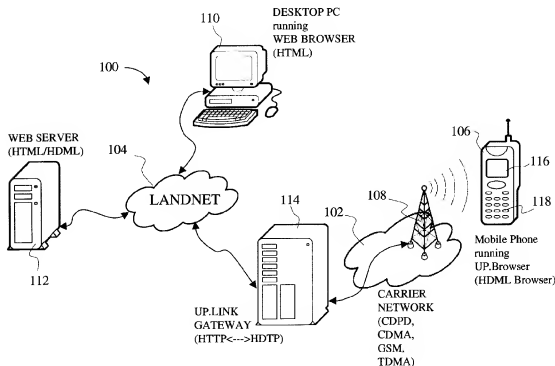
5,542,046	7/1996	Carlson et al.	713/200
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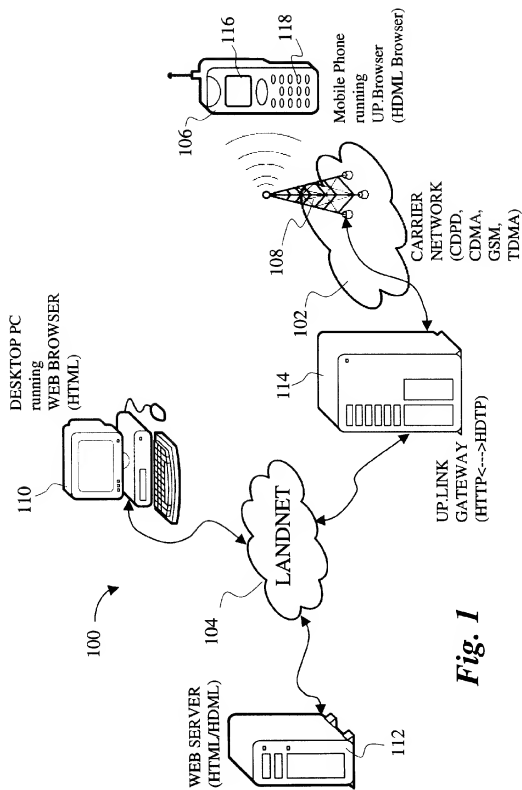
Primary Examiner—Thomas R. Peeso

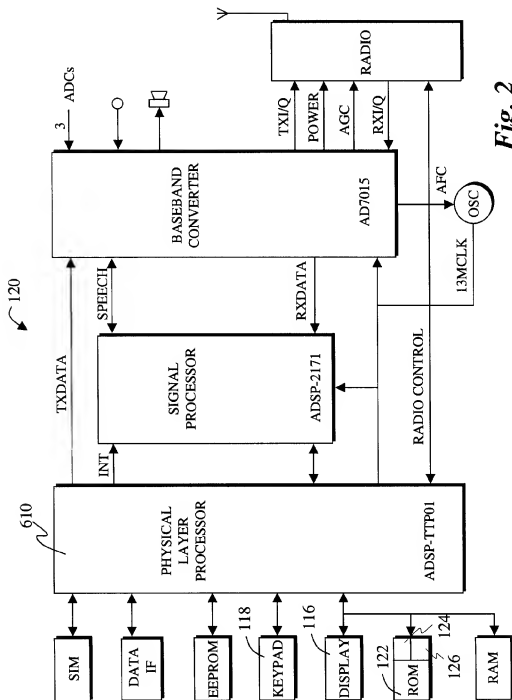
Attorney, Agent, or Firm—Alan D. Minsk; Joe Zheng

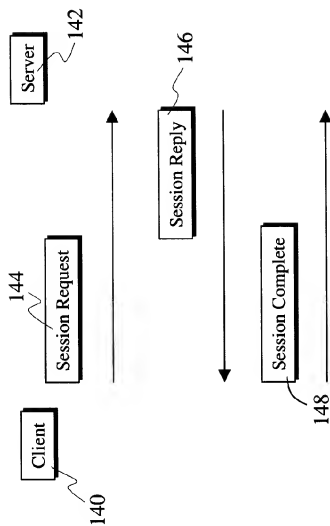
[57] **ABSTRACT**

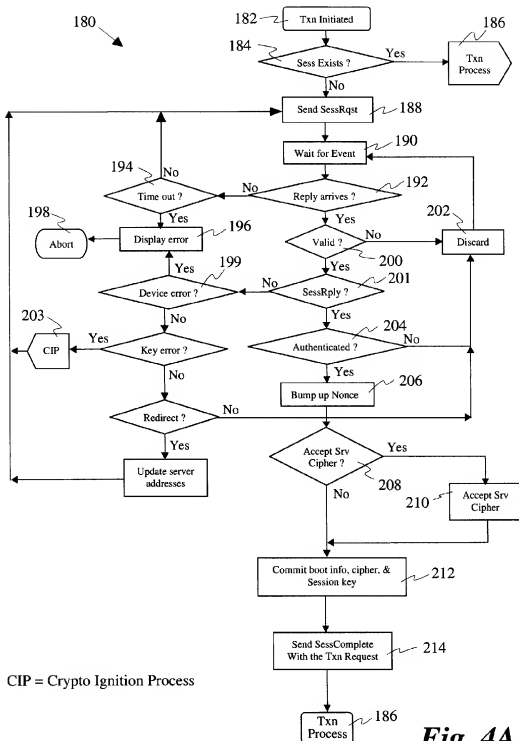
The present invention is a method and system for establishing an authenticated and secure communication session for transactions between a server and a client in a wireless data network that generally comprises an airnet, a landline network and a link server therebetween. The client having limited computing resources is remotely located with respect to the server and communicates to the server through the wireless data network. To authenticate each other, the client and the server conduct two rounds of authentication, the client authentication and the server authentication, independently and respectively, each of the authentication processes is based on a shared secret encrypt key and challenge/response mechanism. To reach for a mutually accepted cipher in the subsequent transactions, the server looks up for a commonly used cipher and forwards the cipher along with a session key to the client. The subsequent transactions between the client and the server are then proceeded in the authenticated and secure communication session and further each transaction secured by the session key is labeled by a transaction ID that is examined before a transaction thereof takes place.

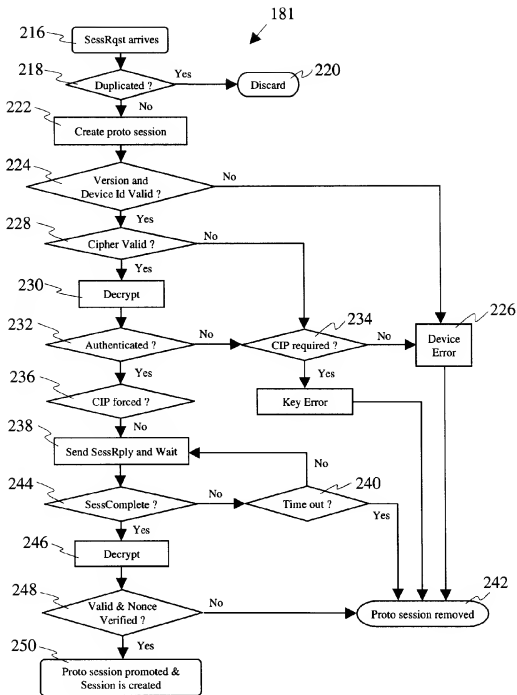
34 Claims, 8 Drawing SheetsMicrofiche Appendix Included
(3 Microfiche, 176 Pages)





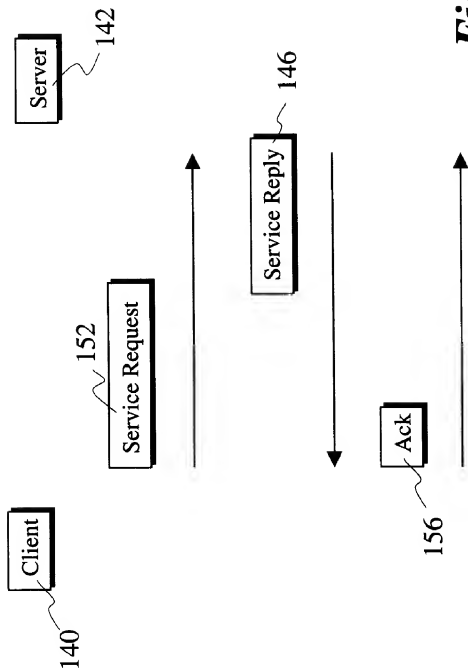
*Fig. 3*

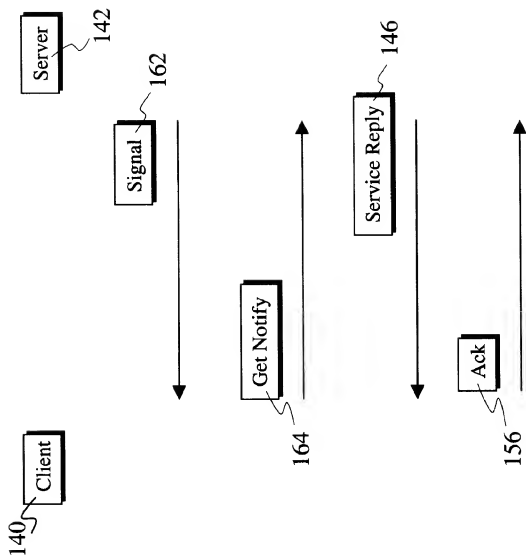


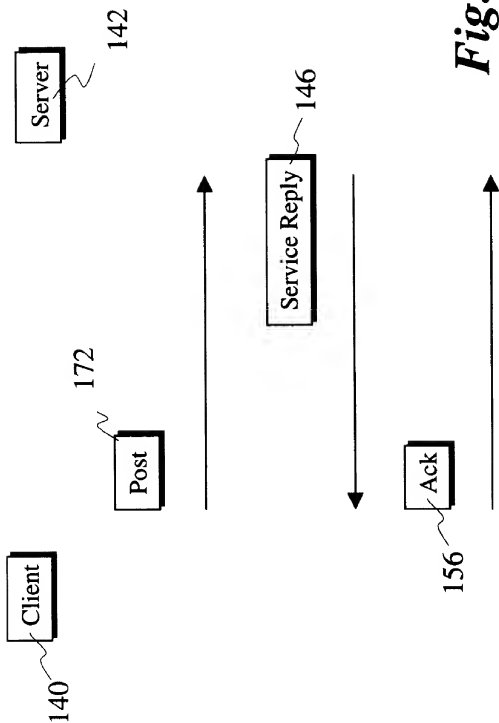


CIP = Crypto Ignition Process

Fig. 4B

**Fig. 5**

*Fig. 6*

*Fig. 7*

METHOD AND SYSTEM FOR SECURE LIGHTWEIGHT TRANSACTIONS IN WIRELESS DATA NETWORKS

REFERENCE TO A "MICROFICHE APPENDIX"

Appendix, which is a part of the present disclosure, is a microfiche appendix consisting of 3 sheets of microfiche having a total of 176 frames. The microfiche Appendix is a source code listing of one embodiment of the present invention, which is described more completely in the sequel.

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BACKGROUND OF THE INVENTION

1. Field of Invention

The invention relates to wireless data communications, and more particularly relates to secure lightweight transactions between mobile devices and landline servers over wireless data networks; wherein the mobile devices have very limited computing power, memory and graphical display capability.

2. Description of the Related Art

A fast-growing trend on the Internet is electronic commerce. The electronic commerce is an integrative concept designed to draw together a wide range of business support services, trading support systems for commodities, products, customized products and custom-built goods and services; ordering and logistic support systems; settlement support systems; and management information and statistical reporting systems, all via the Internet. It is well known, however, that the Internet is a wide open, public and international network of interconnected computers and electronic devices around the world. Anyone who has access to a computer in the network can intercept signals carrying proprietary information traveling along the network. To transact business over the open network, companies or individuals must have an efficient, reliable and secured manner to conduct private communications therebetween. Security thus becomes a primary concern over the open Internet and there have been many efforts in progress aimed at protecting the proprietary information travelling in the Internet. One of the efforts is to use cryptographic techniques to secure a private communication between two parties. The cryptographic techniques provide a way to transmit information across untrusted communication channel without disclosing the contents of the information to anyone accessing the communication channel.

U.S. Pat. No. 5,671,279 to Taher Elgamal discloses a courier electronic payment system for conducting the electronic commerce using a secure courier system. The system governs the relationship between a customer, merchant, and acquirer gateway to perform credit card purchases over the open network by using a secure connection to simplify the problem of Internet-based financial transactions. Visa International Service Association, in collaboration with Microsoft Corporation, provides a secured transaction technology using digital signature to authenticate a credit card and merchant deal, referring to <http://www.visa.com> for detail. The technologies developed by RSA Data Security, Inc. are the global de facto standard for public key encryption

and digital signature and may be part of existing and proposed standards for the Internet as well as business and financial networks around the world. More information about the Internet security can be found at <http://www.rsa.com>.

The above and other ongoing efforts are all primarily targeted at the Internet that is a plurality of landline or wired networks. To use the Internet, one has to have a physical access to a computer wired into the network. To provide the mobility of the network, wireless data networks were introduced, as such the landline networks become an integral part of the wireless data networks. With the wireless data networks, people, as they travel or move about, are able to perform, through wireless computing devices or handheld communication devices, exactly the same tasks as they could do with computers in the landline networks. Similar to the Internet, however, the nature of the wireless communications provides an opportunity for intrusion since the mobile data is sent through the air. Anyone who has an appropriate receiver with a designed antenna can intercept signals being communicated between a wireless computing device and a landline base-station or network. Privacy, authentication, authorization, and integrity are thus deemed the important elements in a wireless data network. Therefore additional efforts have been started to ensure that the proprietary information is sent via wireless networks that must be restricted only to those with a need to know.

Many networks employ encryption and other security measures to protect mobile data from access by an unauthorized third party. Certain technologies and access methods contribute to network security. Spread spectrum technology, for example, is inherently secure, but it only provides a link level security. There is no guarantee that a mobile device has a secure communication to a landline device through a complete wireless network that generally comprises an airnet, the Internet and a gateway therebetween. U.S. Pat. No. 5,604,806 to Hassan, et al, discloses an apparatus and method for secure radio communication by using key sequences derived from the short-term reciprocity and radio spatial decorrelation of phase of the radio channel. U.S. Pat. No. 5,371,794 to Whitfield, et al, shows another method and apparatus for providing a secure communication between a mobile wireless data processing device and a base data processing device. The mobile device sends the base device a digitally signed mutually trusted certificate according to a public encryption key and the base device sends a modified version to the mobile device upon successfully recovering the certificate. If the mobile device recovers the modified version, both devices enter a secure data communication. The disclosed system by Whitfield may work well with mobile devices that have competitive computing resources to satisfy the public-key-based encryption speed. Nevertheless the connection time in an airnet is expensively measured and many mobile devices such as mobile phones have a small fraction of the computing resources provided in a typical desktop or portable computer. The computing power in a typical cellular phone is less than one percent of what is in a regular desktop computer, the memory capacity thereof is generally less than 250 kilobytes and the LCD display is perhaps four lines high by twelve or twenty characters, the graphics capabilities thereof are very limited or nearly nonexistent. There has been thus a great need for a generic solution that provides a secure communication with competitive performance between mobile devices of limited computing resources and landline devices through an open network.

Further many current networks operate based on Hypertext Transfer Protocol (HTTP) that is built on the Transmis-

sion Control Protocol/Internet Protocol (TCP/IP). But the TCP protocol requires considerable computing power and network bandwidth resources. A single connection, for example, may require an exchange of more than ten packets between a sender and a receiver in the Internet. Therefore there has been further a need for a generic method and system that provide a secure communication between mobile devices and landline devices using fewer number of packets so as to increase transmission efficiency in mobile devices of limited computing resources.

SUMMARY OF THE INVENTION

The present invention has been made in consideration of the above described problems. According to a preferred embodiment, the present invention is a method and system for establishing an authenticated and secure communication session for transactions between a server and a client in a wireless data network that generally comprises an airnet, a landline network and a link server therebetween. The client is remotely located with respect to the server and communicates to the server through the wireless data network. The method comprises the steps of:

- (a) the client sending a session-request signal to the server for creating the session therebetween, the session-request signal comprising at least one client message encrypted according to a shared secret encrypt key;
- (b) the server conducting a first client authentication by decrypting the encrypted client message according to the shared secret encrypt key upon receiving the session-request signal;
- (c) the server generating a session key for the session in creation, a first derivative from the decrypted client message and generating a server message;
- (d) the server sending a session-reply signal comprising the session key, the first derivative and the server message; the session key, the first derivative and the server message being encrypted according to the shared secret encrypt key;
- (e) the client conducting a first server authentication by decrypting the first derivative and the server message being encrypted according to the shared secret encrypt key;
- (f) the client conducting a second server authentication by validating the first derivative with the client message;
- (g) the client generating a second derivative from the server message if the step (f) of the second server authentication succeeds;
- (h) the server conducting a second client authentication by decrypting the second derivative and verifying the second derivative with the server message upon receiving; thereby the authenticated and secure communication session is established between the client and the server after the first and the second client authentication as well as the first and the second server authentication are all successful.

Upon the establishment of the secure communication between the client and the server, either the client or the server may initiate a transaction therebetween. To ensure the transaction between a valid session, the transaction is encrypted by a mutually accepted cipher according to the session key and identified by a session ID embedded therein. The mutually accepted cipher is obtained by the server through a cipher negotiation with the client and the transaction ID in the transaction is always examined in the server before the server responds to the client with a service reply.

Upon receiving the service reply from the server, the client can proceed the transaction with the server.

The system for establishing an authenticated and secure communication; the system comprises:

- a landline network running on a first communication protocol that is usually HTTP;
- at least one server coupled into the landline network and communicating with the landline network;
- an airnet running on a second communication protocol that is usually HDTTP;
- a client remotely located with respect to the server and communicating with the airnet by radio transmission means;
- a link server, coupling the airnet to the landline network, for linking the first communication protocol to the second communication protocol, whereby the client can communicate with the server;
- means for generating a session-request signal comprising at least one first message encrypted according to a shared secret encrypt key; the first message usually being a first nonce represented by a first 2-byte numeral, the session-request signal being transmitted to the airnet;
- means for sending a session-reply signal comprising at least one second message encrypted according to the shared secret encrypt key; the second message usually being a second nonce represented by a second 2-byte numeral, the session-reply signal sending means comprising:
- means for conducting a first client authentication when the session-request signal is received, the first client authentication comprising means for recovering the encrypted first message from the received session-request signal; and
- means for generating a first derivative from the recovered first message;
- means for conducting server authentication upon receiving the session-reply signal, the conducting server authentication means comprising:
- means for recovering the encrypted second message when the session-reply signal is received; and
- means for verifying the received first derivative with the first message; and
- means for generating a second derivative from the second message;
- means for generating a session-authentication-complete signal comprising the second derivative;
- means for conducting a second client authentication, the second client authentication means comprising means for verifying the received second derivative with the second message when the session-authentication-complete signal is received; and
- whereby the authenticated and secure communication between the client and the server is established when the first and second client authentication and the server authentication are complete.

Accordingly, an important object of the present invention is to provide a generic solution for secure lightweight transaction in wireless data networks. Other objects, together with the foregoing are attained in the exercise of the invention in the following description and resulting in the embodiment illustrated in the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other features, aspects, and advantages of the present invention will become better understood with regard

to the following description, appended claims, and accompanying drawings where:

FIG. 1 shows a schematic representation of a mobile data network in which the present invention may be practiced;

FIG. 2 depicts a block diagram of a typical GSM digital cellular phone used in the embodiment of the disclosed invention;

FIG. 3 illustrates the process of mutual authentication between a client and a sever;

FIG. 4A and FIG. 4B depict a data flowchart representing the session creation process in the client and the server, respectively; of FIG. 3 in one embodiment of the present invention;

FIG. 5 shows a schematic diagram of a service transaction;

FIG. 6 shows a schematic diagram of a notification transaction; and

FIG. 7 shows a schematic diagram of a post transaction.

DETAILED DESCRIPTION OF THE INVENTION

The detailed description of the present invention in the following are presented largely in data flowing representation that resemble the operations of data processing devices coupled to networks. These process descriptions and representations are the means used by those experienced or skilled in the art to most effectively convey the substance of their work to others skilled in the art. The present invention is a method and system for secure data communications. The method along with the system or architecture to be described in detail below is a self-consistent sequence of steps leading to a desired result. These steps or processes are those requiring physical manipulations of physical quantities. Usually, though not necessarily, these quantities may take the form of electrical signals capable of being stored, transferred, combined, compared, displayed and otherwise manipulated. It proves convenient at times, principally for reasons of common usage, to refer to these signals as bits, values, elements, symbols, operations, messages, terms, numbers, or the like. It should be borne in mind that all of these similar terms are to be associated with the appropriate physical quantities and are merely convenient labels applied to these quantities.

Referring now to the drawings, in which like numerals refer to like parts throughout the several views. FIG. 1 shows a schematic representation of a wireless data network **100** in which the present invention may be practiced. The data network **100** comprises an airnet **102** and the landline network **104**, each acting as a communication medium for data transmission therethrough. The landline network **104** may be the Internet, the Intranet or other private networks. For simplicity, the landline network **104** will be herein simply referred to as the Internet, literally meaning either the Internet or the Intranet or other private network. Further the airnet **102**, meaning an unwired network in which data transmission is via the air, is sometimes referred to as a carrier network because each airnet is controlled and operated by a carrier, for example AT&T and GTE, each having its own communication scheme, such as CDPD, CDMA, GSM and TDMA. Referenced by **106** is a mobile data device, but resembling a mobile phone, in communication with the airnet **102** via an antenna **108**. It is generally understood that the airnet **102** communicates simultaneously with a plurality of mobile computing devices of which a mobile phone **106** is shown in the figure. Similarly con-

nected to the Internet **104** are a plurality of desktop PCs **110** and a plurality of web servers **112**, though only one representative respectively shown in the figure. The PC **110**, as shown in the figure, may be a personal computer SPL **300** from NEC Technologies Inc. and runs a web browser via the Internet **104** to access information stored in the web server **112** that may be a workstation from SUN Microsystems Inc. It is understood to those skilled in the art that the PC **110** can store accessible information so as to become a web server as well. Between the Internet **104** and the airnet **102** there is a link server **114** performing data communication between the Internet **104** and the airnet **102**. The link server **114**, also referred to as link proxy or gateway, may be a workstation or a personal computer and performs a protocol mapping from one communication protocol to another, thereby a mobile device **106** can be in communication with any one of the web servers **112** or the PCs **110**, respectively.

The communication protocol in the Internet **104** is HTTP that runs on TCP and controls the connection of an HTML Web browser to a Web server and the exchange of information therebetween. An extended version thereof, called HTTPS, provides encrypted authentication and session transmission between a client and a server. The communication protocol between the mobile device **106** and the link server **114** via the airnet **102** is Handheld Device Transport Protocol (HDTTP), or Secure Uplink Gateway Protocol (SUGP), which preferably runs on User Datagram Protocol (UDP) and controls the connection of a HTML Web browser to a link server, where HDTTP stands for Handheld Markup Language. The specification thereof and the HDTTP specification are provided at <http://www.wapforum.org> or <http://www.phone.com> that are incorporated herein by reference. Further a reference specification entitled "Magellan SUGP Protocol" is incorporated herein by reference. The HDTTP is a session-level protocol that resembles the HTTP but without incurring the overhead thereof and is highly optimized for use in mobile devices that have significantly less computing power and memory. Further it is understood to those skilled in the art that the UDP does not require a connection to be established between a client and a server before information can be exchanged, which eliminates the need of exchanging a large number of packets during a session creation. Exchanging a very small number of packets during a transaction is one of the desirous features for a mobile device with very limited computing power and memory to effectively interact with a landline device.

According to one preferred embodiment, the present invention may be practiced with a cellular phone, a typical example of the mobile device **106**, that has very limited computing power and memory. The cellular phone **106** is used as a client in communication to a landline device that is often referred to as a server providing accessible information therein to other devices. FIG. 2 shows a block diagram of a typical GSM digital cellular phone **120**. Each of the hardware components in the cellular phone **120** is known to those skilled in the art and so the hardware components are not to be described in detail herein. Although the user interface of the phone **120** is not shown in the figure, the mobile device **118**, resembling a cellular phone, in FIG. 1 may be referenced thereto, in which referenced by **116** is a LCD screen and **118** is a key button pad, respectively. Through the screen **116** and the keypad **118** controlled by a user of the phone, the phone can be interactively communicated with a server through the airnet, link server and the Internet. According to one embodiment of the present invention, compiled and linked processes of the present invention are stored in ROM **122** as a client

module 124 and support module 126. Upon activation of a predetermined key sequence utilizing the keypad 118, a physical layer processor or microcontroller 118, initiates a session communication to the server using the module 124 in the ROM 122.

To establish a secured communication between a client and a server, an authentication process must be conducted first to ensure that only interested parties are actually in the communication therebetween. The process is complete through two rounds of independent authentication, one being the client authenticated by the server, referred to as client authentication, and the other being the server authenticated by the client, referred to as server authentication. Further each authentication is completed in two separate steps for high grade of security, which will be described in detail below. The success of the mutual authentication processes provision an evidence that the two communicating parties possesses a valid shared secret encrypt key through a mutual decryption and a challenge/response mechanism. The mutual decryption mechanism comprises the steps of mutually recovering encrypted messages from two involved communicating parties. The challenge/response mechanism, referred to as nonce verification, verifies a predetermined relationship between a sent nonce and a received derivative thereof.

In one preferred embodiment of the present invention, the authentication process is conducted with three message exchanges; a Session Request (SR), a Session rePly (SP), and a Session Completion (SC). FIG. 3 illustrates a schematic representation of the authentication process. The client 140, representing a mobile device, to conduct a transaction with the server 142, representing a landline server or PC, initiates a SR 144 to be sent to the server 142 by first creating a client proto-session. A client proto-session is a session data structure that gets initialized when a session creation starts. The initialized SR 144 comprises the following information:

sessionID—an identifier identifying all requests from the client to the server; In the case of requesting a session, sessionID is always assigned to 0;

cipher—a two-byte number representing the choice of the encryption the client is currently using as there are a number of encryption schemes available in a communication protocol;

version—a one byte number representing the HDTP protocol version in use, used to determine the underlying format of the communication protocol such as PDU;

header—up to 32767 bytes, comprising token/value pairs that apply to an entire session and may be automatically applied to subsequent service requests or session specific parameters, therefore the header is generally cached in the server till the current session completes; and

C-nonce—a client nonce represented with a non-repeatable number, usually 2 bytes, used for the client to conduct a following server authentication.

C-nonceModified—a modified version of the client nonce, used for the server to conduct a nonce verification in the following client authentication.

Further the cipher in the SR 144 includes an identifier to an encryption algorithm and associated parameters thereof. To be more specific, the first byte in the cipher represents an identifier to a combination of the encryption algorithm, the key size (e.g. 128-bit for US or 40-bit for foreign countries) and content of a security attachment thereto and the second byte in the cipher indicates the additional parameters related to the first byte. For example, value 1 in the first byte

indicates that the encryption algorithm is block cipher RC5, the key size thereof is 128 bit, a two byte check-sum therein is used as the MAC (Message Authentication Code), no IV (Initialization Vector for block ciphers) therefore is transmitted over the network, and padding bytes are added if necessary. The block cipher algorithm RC5 is part of the RSA's BSAFE product. It can be further appreciated that the identifier in the cipher may be assigned to a unique value to identify a non-secure session if so desired. The C-nonce is a non-repeatable number initially and randomly generated in the client and the modified version thereof, C-nonceModified, is generated from the C-nonce through an operational relationship; for example the Exclusive-OR relationship or expressed as follows:

$$C_nonceModified = 2 \text{ byte number} \oplus C_nonce.$$

It can be appreciated by those who are skilled in the art that there are many ways to get the C-nonceModified from a C-nonce, the Exclusive-OR is one of the operational relationships used in one embodiment of the present invention. Both C-nonce and C-nonceModified are encrypted using the shared secret encrypt key between the client 140 and the server 142. The purpose of the C-nonceModified is to provide the server that receives the SR with means for ensuring that C-nonce is correctly decrypted and validated by examining the C-nonce and its relationship with the C-nonceModified. Both should not be altered after a successful decryption of the C-nonce and the C-nonceModified. In other words, a SR message or signal may be expressed as follows:

SR={sessionID, cipher, version, type, device ID, header, Entry [nonce, nonceModified]};

where Entry[] means that the parameters or contents in the bracket are encrypted accordingly. When the SR is sent by the client to the server to request a session creation, both C-nonce, C-nonceModified are encrypted according to the cipher the client is using at the time the SR is sent out.

Upon receiving the SR from the client 140, the server 142 creates a server proto session for the client 140 with a session identifier, referred to as a session ID, to identify the session context for the session just created in the server 142. A server proto-session is a session entry marked as a proto status in a session table, which indicates that the session is not authenticated and is not able to conduct any transactions with the client. It is understood to those skilled in the art that the proto-session can be kept in the RAM of the server. If a proto-session already exists for that client, it is re-used. The information in the received SR is saved in the server proto-session. If the server 142 is satisfied with the fact that the client is known, namely Entry[C-nonce, C-nonceModified] in the received SR are successfully decrypted with the shared secret encrypt key, the step one in the client authentication is successful and a corresponding session key is generated and stored with the server proto session entry. It may be noted herein that many encryption schemes used in this invention, such as RC5, have a procedure that adds and validates the Message Authentication Code such as the check-sum, to assure that the encrypted message is correctly decrypted, the procedure, every time the decryption takes place, is used herein to examine the transaction integrity, namely to assure the received messages or signals are unaltered in the course of data transmission. If the step one client authentication is not successful, namely Entry[C-nonce, C-nonceModified] in the received SR are

not fully decrypted or supported, the proto session is aborted and removed from the proto session table, resulting in a failed session creation. What the support means herein is the cipher proposed or used by the client is also used by the server, for example the client uses the RC5 encryption to encrypt $\text{Encry}[C\text{-nonce}, C\text{-nonceModified}]$, to decrypt $\text{Encry}[C\text{-nonce}, C\text{-nonceModified}]$, the server must be equipped with the same RC5 encryption capability therein. If $\text{Encry}[C\text{-nonce}, C\text{-nonceModified}]$ can not be successfully decrypted due to other reasons such as transmission errors, the client must reinitiate a new session request to the server in order to establish a secure communication with the server. To challenge a step two server authentication subsequently at the client side, a derivative of the client nonce or C-nonce, is generated therefor. In one embodiment of the present invention, the derivative is created by adding a constant to the client nonce, for example $\text{derivative} = C\text{-nonce} + 1$. The purpose of the derivative is to provide the client with means for reassuring that the C-nonce is correctly decrypted by the server and the server is the authenticated one it is in communication with.

Right after the successful step one client authentication, the server 142 responds to the client with a Session Reply (SP) 146 to begin a second round authentication; server authentication. The SP 146 comprises the following information:

C-SID—a one byte number indicates the sessionID originally assigned in the client, to be more specific C-SID=0 indicates a clear text client session, C-SID=1 indicates a shared secret key encrypted session, and C-SID=2 indicates a session key encrypted session. In the context of the current description, C-SID=1.

key—a session key to be used with a mutually acceptable encryption, and to be used for encryption and decryption in all transactions in the session;

derivative—a number derived from the C-nonce for the client to perform the subsequent server authentication;

S-nonce—a non-repeatable number, used for the server to conduct a following step-two client authentication; it should be noted that S-nonce is generated by the server and generally different from the C-nonce by the client; and

cipher—a two-byte number representing the choice of the encryption the server proposes after the client proposed cipher is received. It may or may not be the same as the one used in the client, to be more specific, the cipher is the same as the one proposed by the client when the server supports the client proposed cipher, otherwise the cipher is the one currently used in the server.

In other words, the SP can be expressed as follows:

$\text{SP} = [C\text{-SID}, \text{Encry}[\text{sessionID}, \text{key}, S\text{-nonce}, \text{derivative}, \text{cipher}]]$

When the client 140 receives the SP 146 from the server 142, it performs the step one server authentication, which is considered successful if $\text{Encry}[\text{sessionID}, \text{key}, S\text{-nonce}, \text{derivative}, \text{cipher}]$ in the received SP 146 is decrypted successfully with the shared secret key. If the step one server authentication fails, the client 140 discards the SP 146 and a new session creation may be started over again. Upon the success of the step one server authentication, the client 140 proceeds with the step two server authentication; namely the predetermined relationship between the C-nonce and the derivative thereof should be held for a successful step-two server authentication:

$C\text{-nonce} = \text{derivative} - 1$

If the C-nonce derived from the SP 146 is the same as the C-nonce originally generated by the client, the step two server authentication is successful, hence the server 142 is considered authenticated, trusted from the viewpoint of the client, and the SP 146 is accepted as a valid message, which means that the client 140 then uses the session key and other information in the SP 146 for the session being created. Only with both successful steps of the server authentication, the client 140 marks the session as committed, which means that transactions can be conducted subsequently in the session, again only from the viewpoint of the client 140. If the predetermined relationship between the client nonce and the derivative thereof does not hold, the step two server authentication fails and the received SP 146 is discarded. The client 140 may abort the session creation process if no further SP's are received and pass both steps of the server authentication during the time period allowed for a session creation. To provide the server with means for reassuring the client authentication by itself through the client, a derivative of the S-nonce, similar to the derivative of the C-nonce, is generated.

The client 140 then sends the server 142 a SC 148 to complete the session creation process. The SC 148 comprises the following information:

$SC = [\text{Encry}[\text{derivative}]]$;

where the derivative is the client's response to the server nonce challenge, namely the result of the verification, the derivative is used by the server 142 for step two client authentication. Further it is noted that the SC 148 is an encrypted message, meaning that the client encrypts the information in the SC 148 according to either its own cipher or the server proposed cipher. Generally the client 140 encrypts the information in the SC 148 according to the server proposed cipher if it accepts the server proposed cipher, otherwise, it encrypts the SC according to its own cipher.

It must be noted in one embodiment of the present invention that the SC unlike the SR 144 and SP 146, is piggybacked by a following transaction request to increase data transmission efficient. The data piggybacking means that independent data units may be logically grouped together in one physical data unit to be transmitted to a receiver that recovers all the independent data units upon the receipt of the physical data unit as if all the independent data units were sent, independently and respectively, in separate physical data units.

Upon receiving of Session Complete or SC 148, the server 142 tests if the client 140 uses its own proposed cipher or the server proposed cipher by decrypting the SC twice using the two ciphers if necessary. If the server 142 decrypts the encrypted message in the SC 148 and verifies the relationship thereof with the S-nonce, the step two client authentication is succeeded. Subsequently the server 142 promotes the server proto session to the active session and the session creation process is completed; otherwise, the proto session is removed and the session creation is aborted.

Referring now to FIG. 4A and FIG. 4B, there are shown two data flowcharts 180 and 181 representing a session creation process in the client and the server, respectively, in one embodiment of the present invention. There are generally three types of transactions that are conducted between a mobile device and a landline server: service transaction, notification transaction, and post transaction. Both service and post transactions are initiated by the mobile device that is considered as a client herein and the notification transaction is initiated by the landline server that is considered a

server herein. All transactions must be conducted in the context of a valid and established session. If there is no session or valid session, a session must be created before any transaction can start. For the sake of simplicity, it is assumed that the transaction is initiated at the client side at 182. As described above, for a transaction to take place in a secure communication, a session between a client and a server must be established first. Therefore at 184, the existence of a valid session is examined. If a valid session is in place, the transaction can proceed at 186. If there is no established session, for example, a mobile device is just powered on for the first time or a previous session is beyond a time limit, for example 8 hours, a session request must be initiated and sent to the server at 188. The client is then in a mode of waiting for a reply from the server, constantly looking up for the reply at 190 and 192. If there is no reply from the server, the client may initiate another session request if a fixed time period lapses at 194 or errors occur to have to abort the initiated session request at 196 and 198. The errors occur when the client is out of a service area covered by an airnet that communicates with the server or simply either the client or the server malfunctions at 199.

Meanwhile the session request is received by the server at 216. A proto session is created at 222 per the session request from the client if the session request is not a duplicated one. It is very common that a session request may be retransmitted or re-requested by the client due to some unexpected error conditions in the wireless data network so that duplicated requests may be received. The server, however, uses a tag, which is generated from the encrypted message in the session request first received and is unique for each session request from a particular client, to prevent creating multiple proto sessions from the duplicated session requests. Some of the information in the session request, such as protocol version and device ID are verified at 224. If the verified information is not supported, there might be device error at 226, which results in the removal of the proto session just created. If the verifying process at 224 succeeds, the server proceeds a decryption process, according to a shared secret encrypt key as described above, to decrypt the C-nonce and C-nonceModified at 230. If the operational relationship between the C-nonce and C-nonceModified holds at the server side, the step one client authentication completes. CIP at 203 in FIG. 4A and 234 and 236 of FIG. 4B stands for crypto ignition process which is a process to equip a client with a updated encrypt information, for example, to update the share secret key. As the CIP is an added process and not a key element in the present invention, and no detail description thereof is provided therefore. With the successful step one client authentication, the server at 238 sends a session reply to the client.

When a server is reached and successfully processes the session request from the client, meanwhile the step one client authentication as described above, a session reply is sent by the server to the client to start server authentication at the client side. Upon receiving the session reply from the server being connected, the client examines the reply signal at 200 and 201 and the session reply should be in a recognized format, such as uncorrupted essential information therein. If the received session reply is not recognized or supported, the client discards the received session reply at 202 and continues to wait for a valid session reply, otherwise problems with devices may be claimed in step 199. Upon receiving the session reply from the server, the client proceeds two steps of the server authentication at 204, which has been described above in detail. Logically the session is discarded at 202 if the server authentication fails, namely the client fails to

decrypt and verify the encrypted S-nonce and to validate the derivative of the C-nonce generated by the server. When the server authentication passes, the client chooses either its own cipher or the server proposed cipher obtained from the session reply from the server at 208 and 210 and further the client retrieves the session key therefrom and sends a session complete signal to the server to complete the session creation at 212 and 214.

Meanwhile the server expects a session complete signal from the client it just sends the session reply to at 238. For security purpose, the server drops the proto session at 242 if the time waiting for the session complete signal goes beyond a threshold 240. Upon receiving the session complete signal at 244, the server proceeds the step two client authentication at 246 and 248 by decrypting the encrypted derivative of the S-nonce and verifying the relationship thereof with the original S-nonce. If the decryption of the derivation or the verification with the S-nonce fails, the session creation fails, hence the removal of the proto session. If the step two client authentication succeeds, that means the step one client authentication and the step one and two server authentication have all completed, the session is successfully created by promoting the proto session to the regular session at 250, thereby the transaction originally initiated by the client at 182 of FIG. 4A can proceed therefrom.

To perform transactions in an authentic and secure session, each transaction must be assigned to a transaction ID. In an embodiment of the invention, a new transaction must have a new transaction ID and has to be in a transaction sequence, namely the transaction ID must be greater than any other completed and pending transaction IDs and less than 255 at the time the new transaction is started in the session, for example, transaction ID=12 for a current transaction, the next transaction ID from the client must be 13 or greater in order for the transaction to be accepted by the server. The constant 255 is the maximum number of transactions that can be performed in a valid session. If a transaction ID is smaller than what the session expects, the transaction is discarded without notice. If the transaction ID is greater than 255, a new session is automatically created to accommodate the corresponding transaction. All the data units related to transactions are encrypted with the session key created in the session creation process and the cipher used therein is either the client proposed cipher or the server proposed cipher.

Referring to FIG. 5, there is shown a schematic diagram of a service transaction. The mobile client 140 initiates a Service Request (ISR) 152 to the server 142. A service transaction is typically involved in interaction with a service provider identified by a universal Resource Locator URL in a landline server, therefore the information in a ISR comprising URL and optional header that provides additional session information. Upon receiving the ISR 152, the server 142 processes the received ISR 152 to examine the sessionID and transaction ID therein. If the transaction ID is less than what it expects, the ISR 152 is discarded. In addition, the ISR 152 is discarded if the transaction ID in the received ISR 152 is greater than 255. As described above, for security reason, a maximum of 256 transactions is allowed in a session. If more than the allowed number of transaction occurs in one established session, a new session will be automatically initiated with the transaction ID being started from 0. Upon the successful examination of the service request ISR 152, the server 142 responds with a Service Reply (SRP) 154 that comprises a result in the form of digest of the URL service request and an optional header. Upon receiving the SRP 154 from the server 142, the client 140

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sends the server 142 an acknowledge (ACK) 156 to commit the transaction if the result in the received ISP 154 is positive. Alternatively, the hand-held client can send the server a Cancel to abort the transaction. A typical example is that the client 140 requests to access information stored and identified by the URL as www.abc.com supported at the server 142, however, the URL in the tSR 152 is entered as www.abcd.com, the result in the ISP 154 returns a error message indicating the desired URL could not be found, otherwise the result in the ISP 154 shows the desired URL has been found, now it is up to the user of the client to determine if the client shall proceed with the tSP 156 or cancel to abort the current transaction to try a new or different URL.

Referring now to FIG. 6, there is shown a schematic diagram of a notification transaction. A notification transaction can be initiated by either the client 140 or the server 142. In the case of server initiation, the server 142 initiates the notification transaction by sending to the client 140 a signal data unit, or notification request (NR) 162, to inform the client 140 that there is a notification in pending in the server 142, such as an electronic mail, waiting for immediate attentions from the identified client. Upon receiving of the NS 162, the client 140 sends a Get-Notify (GN) 164 to the server 142 and retrieves its notification contents such as alerts and emails. The server 142, as in the service transaction, replies with a tSR 146. The transaction is committed after an acknowledge signal (AS) 156 is sent to the server 142 and the server 142 receives it. In the case of the client notification, the client 140 initiates the notification transaction when it powers on or switches back to the data mode from voice mode by asking the server 142 if there is any notification in pending. If there is notification in pending, the client 140 handles the notification transaction as if a signal is received. The AS 156 may be piggybacked with a GN when multiple notification transactions are conducted sequentially. If there are multiple notifications are pending at the server 142, the optional header in the tSR 146 indicates that so that the client will automatically start another notification transaction.

Referring now to FIG. 7, there is shown the post transaction. Post transaction is initiated by the mobile client 140. The post transaction is used for a mobile device to update information stored in a WWW service as specified in the URL. The client 140 sends a Post Request (PR) 172, which contains a URL, data for updating, and an optional header. The server 142 processes the PR 172 and responds to the client with a tSR 146. The result in the tSR 146 comes from the WWW service and normally indicates if information update is done. Upon receiving of the tSR 146, the client 140 sends the server 142 an AS 156 to commit the transaction. Alternatively, the mobile client 140 can send the server 142 a Cancel to abort the transaction.

The present invention has been described in sufficient detail with one exemplary embodiment. Alternative embodiments will become apparent to those skilled in the art to which the present invention pertains without departing from its spirit and scope. For example, wireless communications between a server and a personal digital assistant such as Palm Pilot from 3 Com Corporation and also a portable computer that runs under an operating system, for example, Window CE from Microsoft Corporation. Accordingly, the scope of the present invention is defined by the appended claims rather than the foregoing description of one embodiment.

What is claimed is:

1. A method for establishing an authenticated and secure communication session for transactions between a client and

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a server in a wireless data network, the client remotely located with respect to the server, the method comprising:

the client sending a session-request signal to the server for creating the session therebetween, the session-request signal comprising at least one client message encrypted according to a shared secret encrypt key previously residing on both the client and the server;

the server conducting a first client authentication by decrypting the encrypted client message according to the shared secret encrypt key upon receiving the session-request signal;

the server generating a session key for the session in creation, a first derivative from the decrypted client message, and a server message;

the server sending a session-reply signal comprising the session key, the first derivative and the server message, with the session key, the first derivative and the server message being encrypted according to the shared secret encrypt key;

the client conducting a first server authentication by decrypting the first derivative and the server message being encrypted according to the shared secret encrypt key, and

the client conducting a second server authentication by validating the first derivative with the client message.

2. The method as recited in claim 1 wherein session-request signal further comprises a client cipher indicating what encryption the client currently uses.

3. The method as recited in claim 2 wherein session-request signal further comprises a modified version of the client message, the modified version having an operational relationship with the client message and being encrypted according to the shared secret encrypt key.

4. The method as recited in claim 3 further comprising the server negotiating a mutually accepted cipher with the client for the session in creation.

5. The method as recited in claim 4 wherein the server negotiating the mutually accepted cipher with the client comprises examining the client cipher; looking up a server cipher and determining the mutually accepted cipher.

6. The method as recited in claim 5 further comprising: the client initiating a transaction signal comprising a transaction ID to interact with the server;

the client coupling the second derivative from the server message with the transaction signal, thereby a combined signal is formed;

the client sending the combined signal to the server;

the server conducting a second client authentication by validating the second derivative with the server message upon receiving and decoupling the combined signal; and thereby the authenticated and secure communication session is established between the client and the server after the first and second client authentication as well as the first and the second server authentication are all successful;

the server examining the transaction ID to see if the transaction ID is in a trans-sequence;

the server replying to the client with a reply signal; and the client sending an acknowledge signal to commit a transaction specified in the transaction signal initiated by the client.

7. The method as recited in claim 6 wherein the transaction request is a service-request signal comprising a URL.

8. The method as recited in claim 7 wherein the server replying to the client with a reply signal comprises contact-

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ing a service identified by the URL and sending a result in form of digest from the contacting the service identified by the URL.

9. The method as recited in claim 8 wherein the server replying to the client with a reply signal comprises contacting a service identified by the URL and sending a result in form of digest from contacting the service identified by the URL.

10. The method as recited in claim 6 wherein the transaction request is a post signal comprising a URL and editorial information.

11. The method as recited in claim 1 further comprising: the client generating a second derivative from the server message if the second server authentication succeeds; the client sending a session-complete signal comprising the second derivative; and

the server conducting a second client authentication by validating the second derivative with the server message; and thereby the authenticated and secure communication session is established between the client and the server after the first and the second client authentication as well as the first and the second server authentication are all successful.

12. The method as recited in claim 11 further comprising: the client initiating a client transaction request and generating a transaction ID thereof; the client transaction request being encrypted according to the session key; the server examining the transaction ID to see if the transaction ID is in a trans-sequence upon receiving the client transaction request after decrypting the client transaction request according to the session key; the server replying to the client with a reply signal if the server examining the transaction ID is true; and the client sending an acknowledge signal to commit a transaction specified in the client transaction signal.

13. The method as recited in claim 11 further comprising: the server initiating a server transaction signal comprising at least one notification therein; the client replying to the server with a get-notify signal comprising a transaction ID to fetch the notification; the server examining the transaction ID to see if the transaction ID is in a transsequence; the server replying to the client with a reply signal if the server examining the second transaction ID is successful; and

the client sending an acknowledge signal to commit a transaction specified in the transaction signal initiated by the server.

14. A method as recited in claim 11, wherein the session-request signal further comprises a device identifier associated with the client, and wherein the server determines the shared secret encrypt key used to decrypt the encrypted client message based on the device identifier.

15. A method as recited in claim 11, wherein the session-request signal further comprises a device identifier associated with the client, wherein the server supports a plurality of clients, wherein the server stores a plurality of shared secret encrypt keys, each of the shared secret encrypt keys being associated with one of the clients, and wherein the server determines the shared secret encrypt key used to decrypt the encrypted client message based on the device identifier.

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16. The method as recited in claim 1 wherein the client message is a client nonce represented by a sequence of digits.

17. The method as recited in claim 16 wherein the client nonce is a non-repeatable two-byte numeral.

18. The method as recited in claim 17 wherein the first derivative has a first relationship with the client nonce.

19. The method as recited in claim 18 wherein the session-reply signal further comprises a session ID of the session, the session key and the server cipher, all being encrypted according to the shared secret encrypt key.

20. The method as recited in claim 19 wherein the server message is a server nonce.

21. The method as recited in claim 20 wherein the second nonce is a non-repeatable two-byte numeral.

22. The method as recited in claim 21 wherein the second derivative has a second relationship with the server nonce.

23. A method as recited in claim 1, wherein the session-request signal further comprises a device identifier associated with the client, and wherein the server determines the shared secret encrypt key used to decrypt the encrypted client message based on the device identifier.

24. A method as recited in claim 1, wherein the session-request signal further comprises a device identifier associated with the client, wherein the server supports a plurality of clients, wherein the server stores a plurality of shared secret encrypt keys, each of the shared secret encrypt keys being associated with one of the clients, and wherein the server determines the shared secret encrypt key used to decrypt the encrypted client message based on the device identifier.

25. A system for establishing an authenticated and secure communication session, the system comprising:

a landline network running on a first communication protocol;

at least one server coupled into the landline network and communicating with the landline network;

an airnet running on a second communication protocol;

a client remotely located with respect to the server and communicating with the airnet by radio transmission means;

a link server, coupling the airnet to the landline network, for linking the first communication protocol to the second communication protocol, whereby the client can communicate with the server;

means, in the client, for generating a session-request signal comprising at least one client message encrypted according to a shared secret encrypt key; the session-request signal being transmitted to the airnet;

means, in the server, for sending a session-reply signal comprising at least one server message encrypted according to the shared secret encrypt key; the session-reply signal sending means comprising:

means for conducting a first client authentication when the session-request signal is received, the first client authentication comprising means for decrypting the encrypted client message from the received session-request signal; and

means for generating a first derivative from the client message;

means for conducting server authentication upon receiving the session-reply signal, the conducting server authentication means comprising:

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means for recovering the encrypted server message when the session-reply signal is received; and means for verifying the received first derivative with the client message; and

means for generating a second derivative from the server message.

26. The system as recited in claim **25** further comprising: means, in the client, for generating a session-complete signal comprising the second derivative;

means, in the server, for conducting a second client authentication, the second client authentication means comprising means for verifying the received second derivative with the server message when the session-complete signal is received; and

whereby the authenticated and secure communication session between the client and the server is established when the first and second client authentication and the server authentication are complete.

27. The system as recited in claim **26**, further comprising: means, in the client, for initiating a transaction request signal comprising a transaction ID; and

means, in the server, for verifying the transaction ID after the transaction request signal is received.

28. The system as recited in claim **27**, further comprising means, in the server, for sending a reply signal to the client and means, in the client, for acknowledging the reply signal to commit a transaction requested in the transaction request signal.

29. A method for establishing an authenticated and secure communication session for transactions between a client and a server in a wireless data network, the client remotely located with respect to the server, the method comprising:

the client sending a session-request signal to the server for creating the session therebetween, the session-request signal comprising a client session ID, a client cipher, a C-nonce and a C-nonceModified, at least the C-nonce and the C-nonceModified being encrypted by the client cipher according to a shared secret encrypt key with the server;

the server conducting a first client authentication by decrypting the encrypted C-nonce and C-nonceModified according to the shared secret encrypt key upon receiving the session-request signal; the server generating a server session ID and a session key for the session in creation, deriving a first derivative from the decrypted C-nonce and generating a S-nonce upon examining the client session ID;

the server negotiating a mutually accepted cipher with the client for the session in creation, the negotiating comprising examining the client cipher, looking up a server cipher and determining the mutually accepted cipher therefor;

the server sending a session-reply signal comprising the session key, the first derivative and the S-nonce; the session key, the first derivative and the S-nonce being encrypted therein according to the shared secret encrypt key;

the client conducting a first server authentication by decrypting the session key, the first derivative and the S-nonce according to the shared secret encrypt key; the client conducting a second server authentication by validating the first derivative with the C-nonce generated originally in the client;

the client generating a second derivative from the S-nonce if the second server authentication succeeds;

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the server decrypting the second derivative upon receiving the second derivative that is encrypted at the client according to the shared secret encrypt key; and

the server conducting a second client authentication by decrypting the second derivative and verifying the decrypted second derivative with the S-nonce upon receiving the second derivative from the client; thereby the authenticated and secure communication session for transactions between the client and the server is established.

30. The method as recited in claim **29** further comprising: the client initiating a transaction request comprising a transaction identified by a transaction ID and encrypted by the mutually accepted cipher according to the session key; the transaction request comprising a URL identifying a service server in the wireless data network;

the server verifying the transaction ID, performing a MAC verification and replying to the client with a service reply comprising a result of contacting the service server if the transaction ID is in trans-sequence; and

the client committing to the transaction request by sending an acknowledge signal to the server, thereby the transaction is complete in the authenticated and secure communication session.

31. The method as recited in claim **29** further comprising: the server initiating a notification request comprising at least one message notification; the notification request being encrypted by the mutually accepted cipher according to the session key;

the client replying to the server with a get-notify signal comprising a transaction ID to fetch the notification;

the server examining the transaction ID to see if the transaction ID is in a transsequence;

the server replying to the client with a reply signal if the server examining the transaction ID is successful; and the client sending an acknowledge signal to commit an transaction specified in the transaction signal initiated by the server.

32. A system for establishing an authenticated and secure communication session, the system comprising:

a landline network running on a first communication protocol;

at least one server coupled into the landline network and communicating with the landline network;

an airnet running on a second communication protocol; a client remotely located with respect to the server and communicating with the airnet by radio transmission means;

a link server, coupling the airnet to the landline network, for linking the first communication protocol to the second communication protocol, whereby the client can communicate with the server;

means, in the client, for generating a session-request signal comprising a client session ID, a client cipher, a C-nonce and a C-nonceModified, at least the C-nonce and the C-nonceModified being encrypted by the client cipher according to a shared secret encrypt key with the server; the session-request signal being transmitted to the airnet;

means, in the server, for sending a session-reply signal to the landline network, the session-reply signal comprising a server session ID, a server cipher, a S-nonce and

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a first derivative; at least the server cipher, the S-nonce and the first derivation being encrypted by the server cipher according to the shared secret encrypt key; the session-reply signal sending means comprising:
 means for conducting a step one client authentication 5
 when the session-request signal is received, the first client authentication comprising means for decrypting the encrypted the C-nonce and the C-nonceModified from the received session-request signal; and
 means for generating the first derivative from the C-nonce; 10
 means, in the client, for conducting server authentication upon receiving the session-reply signal, the conducting server authentication means comprising: 15
 means for decrypting the encrypted server session ID, server cipher, S-nonce and first derivative when the session-reply signal is received;
 means for verifying the decrypted first derivative with the C-nonce therein; and
 means for generating a second derivative from the S-nonce; 20
 means, in the client, for generating a session-complete signal comprising the second derivative;

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means, in the server, for conducting a second client authentication, the second client authentication means comprising means for verifying the received second derivative with the S-nonce when the session-complete signal is received; and
 whereby the authenticated and secure communication session between the client and the server is established when the first and second client authentication and the server authentication are complete.
 33. The system as recited in claim 32, further comprising:
 means, in the client, for initiating a transaction signal comprising a transaction identified by a transaction ID; and
 means, in the server, for verifying the transaction ID after the transaction signal is received.
 34. The system as recited in claim 33, further comprising:
 means, in the server, for replying to the client with a reply signal if the step of the server examining the transaction ID is successful; and
 means, in the client, for sending an acknowledge signal to commit the transaction specified in the transaction signal initiated by the server.

* * * * *



US006108656A

United States Patent [19][11] **Patent Number:** **6,108,656****Durst et al.**[45] **Date of Patent:** ***Aug. 22, 2000****[54] AUTOMATIC ACCESS OF ELECTRONIC INFORMATION THROUGH MACHINE-READABLE CODES ON PRINTED DOCUMENTS****[75] Inventors:** **Robert T. Durst; Kevin Hunter**, both of Fort Myers, Fla.**[73] Assignee:** **NeoMedia Technologies, Inc.**, Fort Myers, Fla.**[*] Notice:** This patent is subject to a terminal disclaimer.**[21] Appl. No.:** **09/309,869****[22] Filed:** **May 11, 1999****Related U.S. Application Data****[63]** Continuation of application No. 08/967,383, Nov. 8, 1997, Pat. No. 5,933,829.**[60]** Provisional application No. 60/030,166, Nov. 8, 1996.**[51] Int. Cl.** **G06F 17/30****[52] U.S. Cl.** **707/10; 707/3; 707/9****[58] Field of Search** **235/462; 380/25; 395/200.3; 766; 707/10; 514; 9; 3; 705/26; 3; 463/41****[56] References Cited****U.S. PATENT DOCUMENTS**

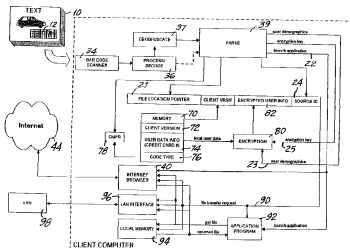
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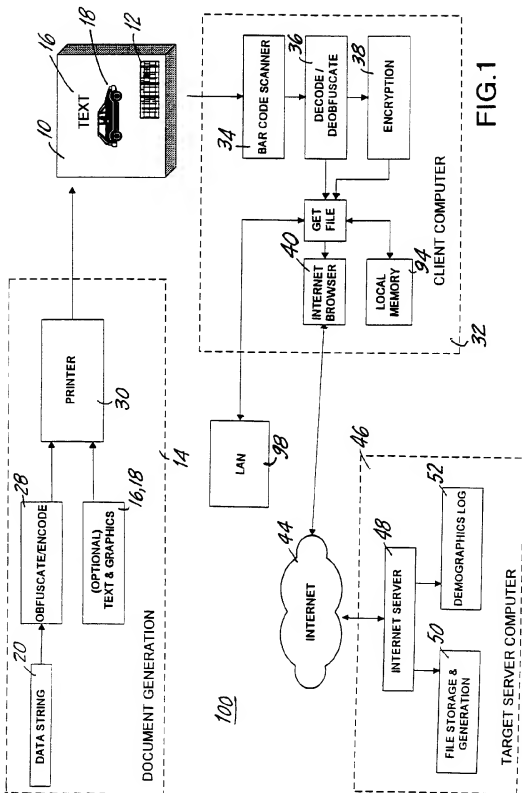
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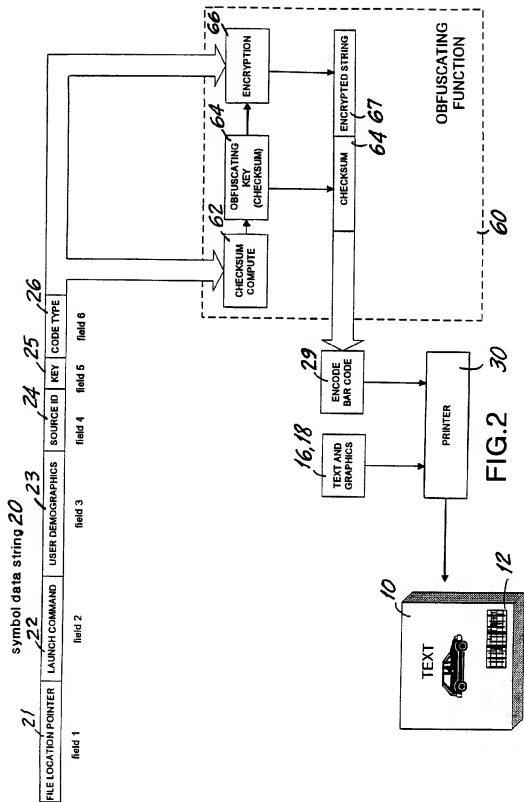
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Primary Examiner—Wayne Amsbury*Assistant Examiner*—Thuy Pardo*Attorney, Agent, or Firm*—Greenberg Traurig, LLP; Anthony R. Barkume**[57] ABSTRACT**

The present invention is a system and method for providing automated access to electronic information stored in a database in either a local or remote location. The system utilizes a machine-readable code printed on a document, referred to herein as an intelligent document since it stores information used to automatically access the information. The machine-readable symbol comprises encoded source data, wherein the source data comprises application launch information as well as file location information. The source data is encoded and printed, and then distributed by the vendor by any logical means to the end user. The end user then scans the code via appropriate code scanning (e.g. bar code scanning) equipment, decodes the raw decoded data, and the file location information is then used to access the appropriate file. In a preferred embodiment, a Web browser program is launched, and the URL of the vendor's Web site is accessed through the Internet. Local file retrieval may also be implemented on the client computer itself, as well as over an intranet or LAN environment. Additional user-specific demographic data such as the user's name and address may also be encoded in the machine-readable code when the document is specifically tailored for individual targeting, such as mailing labels. This demographic information is uploaded to the WWW site for use by the vendor. In addition, the present invention encodes security data, such as an encryption key, for use in secure data transmissions such as electronic commerce over the Internet.

31 Claims, 10 Drawing Sheets





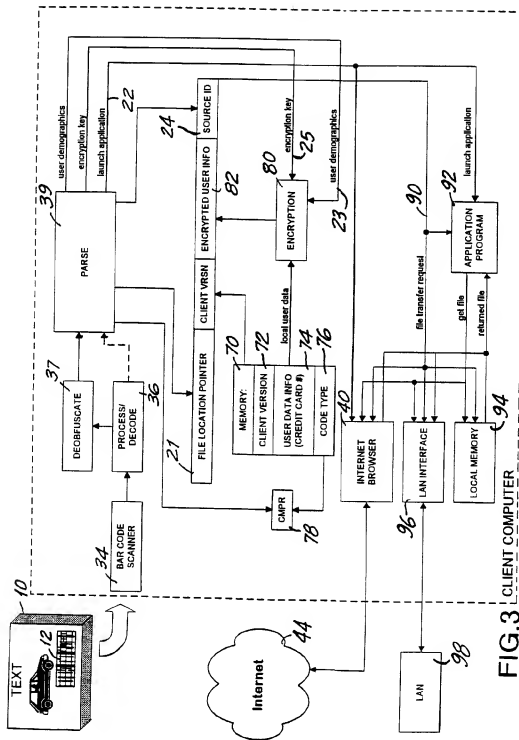


FIG. 3 CLIENT COMPUTER

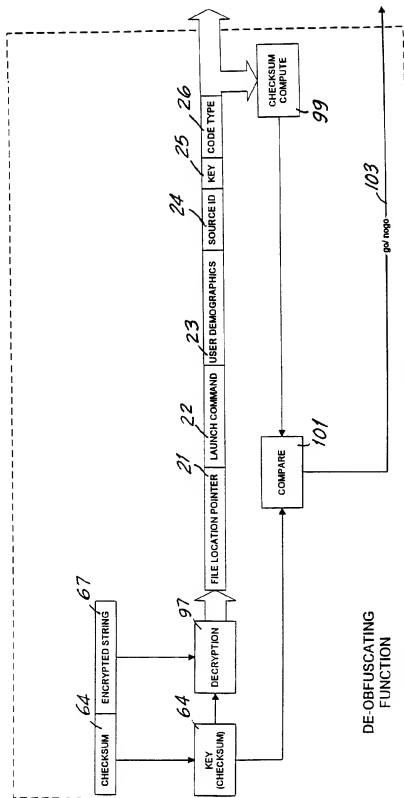
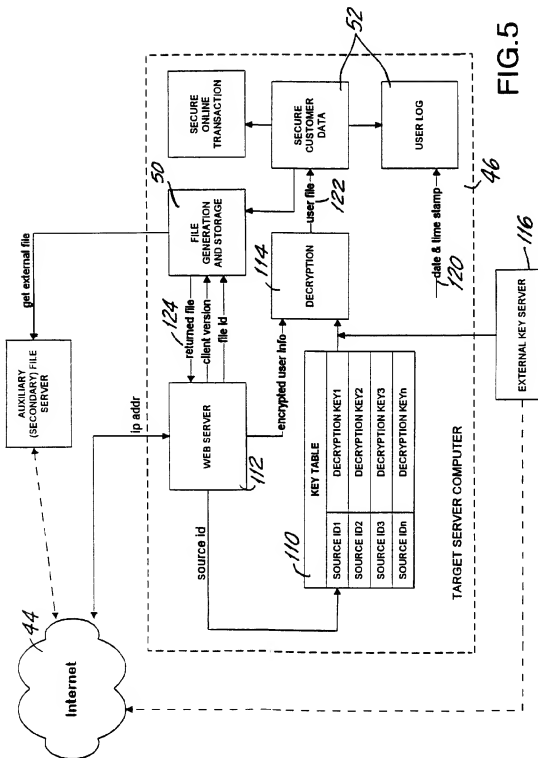
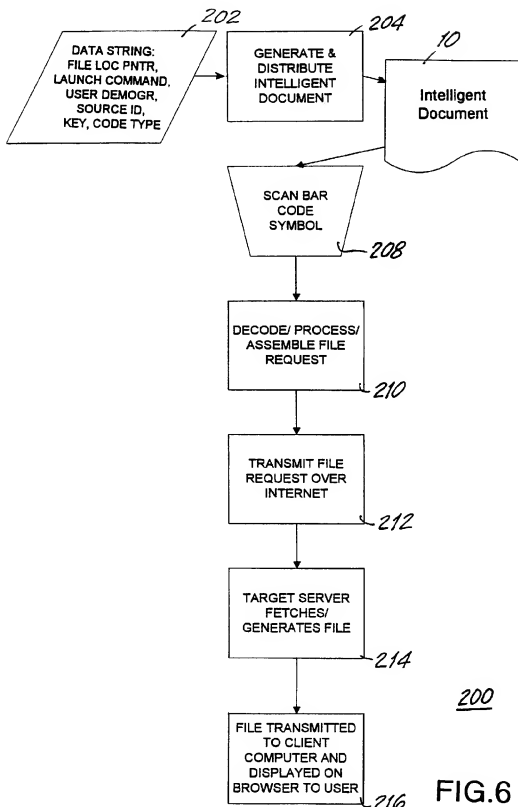
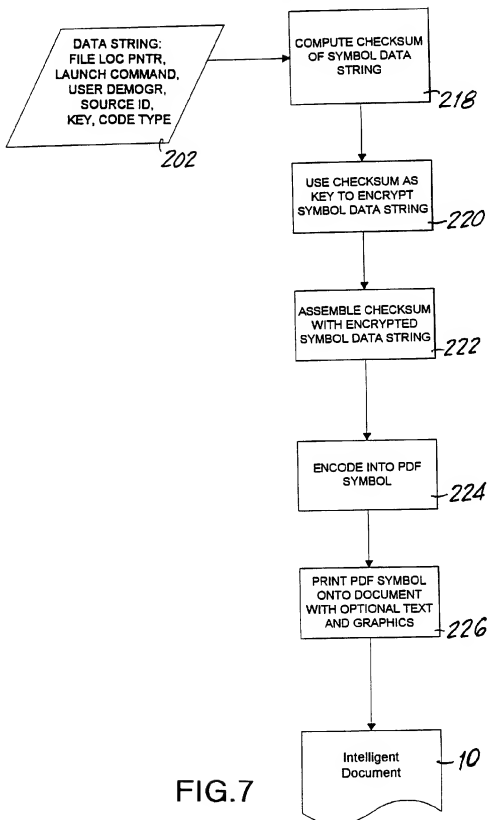


FIG. 4







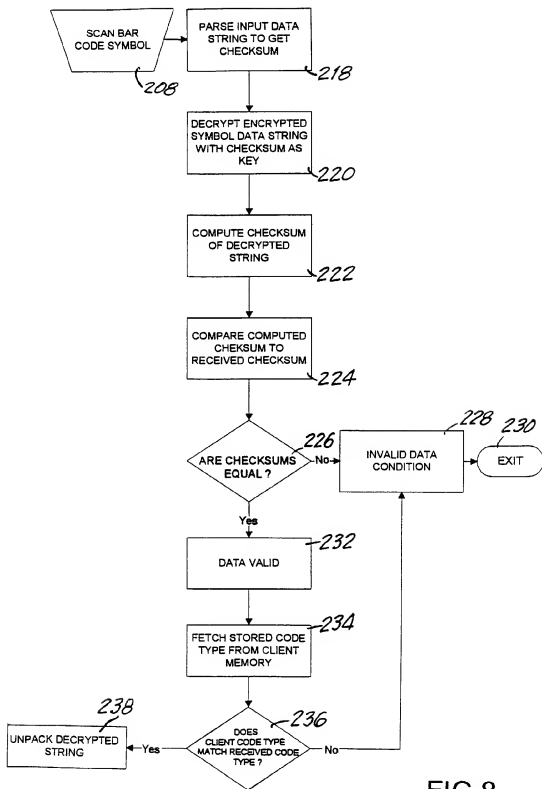


FIG. 8

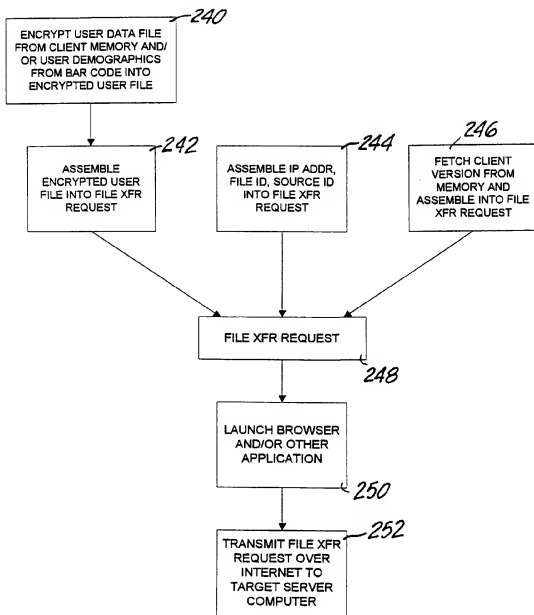


FIG.9

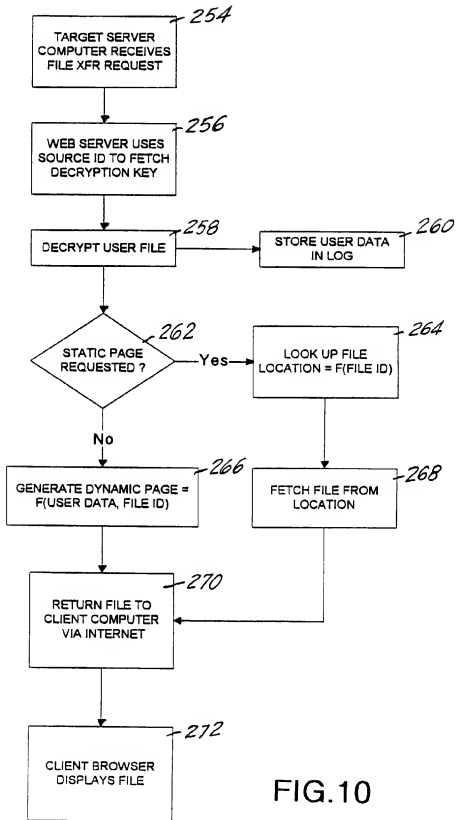


FIG. 10

AUTOMATIC ACCESS OF ELECTRONIC INFORMATION THROUGH MACHINE-READABLE CODES ON PRINTED DOCUMENTS

CROSS-REFERENCE TO RELATED APPLICATION

This application is a continuation application of application Ser. No. 08/967,383, which was filed on Nov. 8, 1997 under U.S. Pat. No. 5,933,829, which was on and claimed the priority of then co-pending provisional patent application filed in the United States Patent and Trademark Office on Nov. 8, 1996 and assigned Serial No. 60/030,166.

BACKGROUND OF THE INVENTION

Electronic data sources, such as conventional databases, the Internet (i.e., the World Wide Web ("WWW")) are a rich and important means of information retrieval and distribution and, increasingly, electronic commerce. However, there are problems finding the information desired in this increasingly complex and changing network of data sources. Recently introduced Internet "search engines", such as YAHOO, help by allowing a user to search on-line indices of information sources, and even full source text, for relevant key words and phrases related to their topic of interest, but even carefully structured queries by experienced users often result in hundreds and even thousands of possible "hits" which are not sufficiently specific to preclude further manual search which is both data resource inefficient and time consuming.

Because of these inefficiencies, as well as general lack of familiarity with search engines and their syntax, users often rely on human readable print and broadcast media advertising to identify source addresses (e.g., Uniform Resource Locators ("URLs")) for Web sites and other online information of interest. Print media is particularly effective since: (1) it is the most ubiquitous method of communication and advertising in the modern world; and (2) a printed document can serve as a persistent reference to be saved and used during a subsequent on-line session.

However, human readable printed source addresses, and especially URL's, are particularly difficult to manually enter in software programs, such as web browsers, due to their length and use of complex and unfamiliar symbols. If the characters in a URL are not entered exactly, retrieval is prevented or, in a limited number of cases, a legal but incorrect source is accessed. This is especially true when URLs incorporate foreign languages and/or complex query instructions to on-line databases, as is increasingly frequent in most Web sites. In addition, the inability to type or otherwise manually enter symbolic address information due to either disability or lack of training complicates use of on-line information resources such as the Internet for millions of individuals.

Finally, it is widely anticipated that Internet access will increasingly be provided through interactive cable television via Web-ready television receivers and set-top boxes used in conjunction with conventional television receivers. In this home entertainment environment, it is difficult to use keyboards for address entry due to both lack of typing skill and the cumbersome placement of these components. Another method which would eliminate typing and allow users to directly link printed addresses and query scripts to electronic information sources would be highly desirable.

Companies that host Web sites for the purpose of providing information such as advertising, often want to know the

identity and other related information of the users who visit their sites (i.e., download files therefrom). It would be quite advantageous to provide such companies or vendors with this information as part of a specific file transfer request, e.g., as part of a CGI parameters string included in a URL. Additionally, it would be desirable to be able to effect a secure manner of transferring this information, so that a user would have confidence in the system and thus send sensitive information such as a credit card number or the like with the file transfer request. This would enable electronic commerce to flourish well beyond the point it exists today.

SUMMARY OF THE INVENTION

The present invention is a system and method for providing automated access to electronic information stored in a database in either a local or remote location. The system utilizes a machine-readable code printed on a document, referred to herein as an intelligent document since it stores information used to automatically access the information. The machine-readable symbol comprises encoded source data, wherein the source data comprises application launch information as well as file location information. The source data is encoded and printed, and then distributed by the vendor by any logical means to the end user. The end user then scans the code via appropriate code scanning (e.g. bar code scanning) equipment, decodes the raw decoded data, and the file location information is then used to access the appropriate file. In a preferred embodiment, a Web browser program is launched, and the URL of the vendor's Web site is accessed through the Internet. Local file retrieval may also be implemented on the client computer itself, as well as over an intranet or LAN environment. Additional user-specific demographic data such as the user's name and address may also be encoded in the machine-readable code when the document is specifically tailored for individual targeting, such as mailing labels. This demographic information is uploaded to the WWW site for use by the vendor. In addition, the present invention encodes security data, such as an encryption key, for use in secure data transmissions such as electronic commerce over the Internet.

In particular, the present invention is a method and system for a computer, such as a client computer in a networked computer system, to retrieve a computer file in which a symbol data string comprising a file location pointer is encoded into a machine readable symbol such as a two-dimensional bar code symbol, and the machine readable symbol is rendered within a data carrier (e.g. printed on an intelligent document). A computer input device such as a two-dimensional bar code scanner is coupled to the client computer and transposes an input data string from the machine readable symbol. The computer parses the input data string to determine the file location pointer, and the file location pointer is then utilized pointer to request the computer file designated thereby.

The file location pointer may be utilized to request the computer file by either passing it to an application program on the client computer suitable for processing the corresponding computer file, and then the application program retrieving the computer file from the specified file location. Alternatively, the file location pointer may be utilized to request the computer file by retrieving a copy of the computer file from the specified file location, and then invoking an application program on the client computer suitable for processing the corresponding computer file.

The client computer assembles a computer file transfer request word including the file location pointer and transmits

the request word to a target server computer over a computer network system, which may be a wide area network such as the Internet or a local area network (LAN) or intranet. The file location pointer may alternatively specify the location of a computer file stored in a local memory resident in the client computer rather than on a target server computer. When the computer file to be retrieved is on a target server computer on a network, then the file location pointer is a network address associated with the target server computer and a file identifier correlated to the computer file requested by said client computer. In particular, when utilizing the Internet, the file location pointer may be in the form of a uniform resource locator (URL). In any type of networked environment, the target server computer receives the computer file transfer request word and transmits a computer file to the client computer in response thereto.

In addition to the file location pointer, the present invention takes advantage of the information density of the two-dimensional symbology by encoding a source identifier data string within the machine readable symbol. The source identifier data string is used to denote the particular source of the data carrier such as a particular magazine or ad, or can be used to denote an expected user or targeted group of users of the data carrier. The source identifier string is then transposed by the client computer, assembled within the computer file transfer request word, and transmitted to the target server computer. The target server computer stores the source identifier data string received from the client computer in the computer file transfer request word.

Additionally, the machine readable symbol also has encoded therein an encryption key associated with the source identifier data string, which is also transposed by the computer input device. The encryption key is used by the client computer to encrypt information specific to a user of the client computer, and the encrypted user information is assembled within the computer file transfer request word and transmitted to the target server computer. The information specific to a user may be obtained, prior to encryption, from a user information data file stored on the client computer, or it may be obtained from user demographics data correlated to a targeted user of the data carrier that had been previously encoded within and transposed from the machine readable symbol.

The target server computer may then utilize the source identifier data string received as part of the file transfer request word to access a lookup table to determine a decryption key, and then decrypt the encrypted user information received from the client computer in the file transfer request word. The lookup table may either be stored locally on the target server computer, or it may be stored remotely on a secondary server computer.

The decrypted user information may comprise sensitive user information such as a credit card number associated with the user of said client computer, thus enabling an online electronic commercial transaction by utilizing the credit card number. The user demographics data may be used by the target server computer to determine the file to transmit to the client computer; i.e. certain files may be targeted to specific users of the system.

The machine-readable symbol may also have encoded therein an executable command to launch a software utility resident on the client computer, and the software utility is then automatically launched after the machine readable symbol is transposed. For example, the software utility may be an Internet browser program or a word processing program. In addition, specific functions may also be encoded

in the machine readable symbol along with the application launch command, such as a command to execute a print job of the retrieved computer file.

The symbol data string may optionally be obfuscated prior to being encoded into the machine readable symbol, in which case the input string transposed must likewise be de-obfuscated by the client computer. The obfuscation may be by computing a checksum of the symbol data string, encrypting the symbol data string by utilizing the checksum as an encryption key, and assembling the checksum with the encrypted symbol data string prior to encoding into the machine readable symbol. The de-obfuscation would then be accomplished by parsing the input data string to determine the checksum, decrypting the encrypted symbol data string with the checksum as a decryption key, computing a checksum of the decrypted symbol data string, and comparing the computed checksum with the checksum from said input data string. A valid data condition would be indicated when the comparison step is successful; and an invalid data condition would be indicated when the comparison step is unsuccessful.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a diagram of the system of the present invention.

FIG. 2 is a diagram of the document generation function of FIG. 1.

FIG. 3 is a diagram of the client computer functions of FIG. 1.

FIG. 4 is a diagram of the deobfuscating function carried out by the client computer of FIG. 3, and FIG. 5 is a diagram of the target server computer of FIG. 1.

FIG. 6 is a top level flowchart of the method of the present invention.

FIG. 7 is a flowchart of the document generation of the present invention.

FIGS. 8 and 9 are a flowchart of the scanning and processing by the client computer of the present invention; and

FIG. 10 is a flowchart of method used by the target server computer of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The system 100 of the present invention for generating and reading an intelligent document 100 is illustrated in block diagram form in FIG. 1. The system 100 comprises an intelligent document generation system 14, which encodes, assembles and prints an intelligent document 10 for subsequent scanning at a client computer 32.

The system operates with respect to FIGS. 1 and 6 as follows. A vendor who wishes to provide an intelligent document 10 programs certain parameters which will be encoded within a machine-readable code 12 and printed on the document along with text 16 or graphics 18. The document may be an advertisement in the form of a magazine insert or page, a brochure, a label for an envelope, a memorandum, and the like.

Parameters to be included within the machine-readable code depend upon the application desired by the vendor. For example, if the vendor wants the end-user to be able to load the vendor's world wide web (WWW) site automatically upon scanning the code 12, then the parameters included in the data string 20 that is assembled into the machine-readable code include a command 22 to launch an Internet

browser application, such as NETSCAPE, and a file location pointer such as a uniform resource location (URL) code, such as www.xyzcorp.com (see FIG. 2). This information is encoded with encoding function 20 in accordance with the particular type of machine code being used. For example, one type of code which may be used by the present invention is a PDF417 symbol, which is described in detail in U.S. Pat. No. 5,304,786, which is incorporated by reference herein. The PDF417 symbol, known as a two-dimensional bar code symbol, has enough storage information to encode the browser launch command as well as the URL.

A printer 30 then utilizes the encoded data and desired text 16 and graphics 18 to print an intelligent document 10 as shown in the Figures.

The intelligent document 10 is disseminated to the end user in accordance with the methods desired by the vendor. For example, if the intelligent document is a magazine advertisement, then the user will obtain the magazine by conventional means such as purchase at a retail outlet, the mail, etc. Thus, as shown in FIG. 6, the data string at step 202 is used to generate and distribute at step 204 the intelligent document as desired.

The user, after reading the text and graphics in the document, can access the WWW site of the vendor by utilizing a scanner 34 in conjunction with his computer 32, programmed with appropriate software in accordance with the invention. That is, the user will optically scan the code 12 with an optical scanner 34. An optical scanner 34 sufficient to scan bar code symbols and the like is disclosed in U.S. Pat. No. 5,448,050, which is incorporated herein by reference. The device disclosed in the '050 patent is housed within a mouse type device, thus also including circuitry useful in point-and-click applications popular in personal computer platforms today.

After the two-dimensional bar code data is scanned by the scanner 34 (at step 208), a decoder 36 is used at step 210 to decode the raw data into usable commands and data. The decoder is typically a software program executed by the microprocessor of the computer, and provides thereby the browser launch command and URL which had been encoded by the vendor into the code. The WWW browser application 40 is then loaded, and the URL is used to access the WWW site of the vendor accordingly (at step 212). As a result, the user may automatically access the vendor's WWW site without having to enter the URL, thus eliminating all chances of error due to manual data input. After the file request is made at step 212, the internet server 48 at the target server computer 46 fetches or generates the target file 50, as shown in step 214. As shown in step 216, the file is transmitted to the client computer 32 and displayed on the browser 40 for viewing by the user.

The above scenario is useful when a vendor prints and distributes such intelligent documents on a mass scale. That is, the code distributed is the same for each user. In an alternative embodiment, specific user data is included with the data string 20 to provide for personalized operation as follows. This scenario is useful when the vendor makes individual printings keyed to individual users, such as when mailing labels are printed for inclusion on an envelope surrounding a magazine or the like.

In this case, the vendor may include in the code personal data such as the user's name, location, phone number, and other appropriate demographic information 23. When the user scans the document and loads the WWW site, the personal data is uploaded to the vendor's host computer 46 and stored in demographics log 52, thus providing the

vendor with useful demographic data as to which users have actually utilized the intelligent document scanning service.

The code may also include security information useful in completing secure transfers across the Internet 44. For example, an encryption key 25 appropriate in a public or private key system may be embedded within the code. An appropriate software routine 38 in the user's computer utilizes the key after decoding it in order to encrypt certain data being sent across the Internet 44. For example, the encryption of credit card information is desired in order to thwart would-be intruders from misappropriating the information. The system of the present invention could be used to allow the user to order an item advertised in the brochure by taking the credit card number, already resident in the user's computer memory, and encrypting it with the key decoded from the code. When the user desires to purchase the item, he scans the associated code, and the credit card number is encoded and transmitted after the WWW site is accessed. The host computer can match the user's name (sent with the transmission) with the appropriate decryption key stored at the host, and decrypt the credit card number accordingly.

The system 10 of the present invention has additional embodiments which allow quick and easy retrieval of a data file on a local basis as well as the Internet 44. That is, the same principles may be applied within a company utilizing an intranet or local area network (LAN) 98. Thus, a department of a company may distribute fliers regarding certain events, new products, etc., and encode appropriate document access information in accordance with the teachings of the invention. The user may obtain further information by scanning the code on the document, which then causes his computer to access his network, file server, etc.

This embodiment is also useful in a small office environment, where a user prints out documents such as letters or memos that may need to be revised at a later date. It is common practice to manually type in the drive location of the document in the lower corner of the document to allow the user to easily access the document at a later date, without searching through massive amounts of files. Thus, a user may type in the text "c:\user\files\smith\clients\letters\xyzcorp\jonesltr\dec12" to indicate its location on his drive 94. When he desires to edit or otherwise access the document, he would, in the prior art, have to type in the entire location after launching the proper application (e.g. word processor). In accordance with the teachings of the present invention, a machine readable code may be encoded with this information (as well as a command to launch the application) and printed on the document. When the user later desires to edit the document, he scans the code. The code is decoded, the application is launched, and the file is fetched from the location specified in the code.

The symbol data string 20 may be obfuscated by obfuscation function 28 prior to being encoded into the machine readable symbol. In this situation, the input string transposed by the client computer 32 must be de-obfuscated by de-obfuscation function 60. Referring to FIG. 2, the symbol data string is obfuscated by first computing a checksum of the symbol data string 20 by checksum computation function 62. The checksum is then utilized by the encryption logic 66 as an obfuscating encryption key 64. The symbol data string 20 is input to the encryption logic 66 as shown in FIG. 2, and provided thereby is an encrypted string 67. The encrypted string 67 is assembled with the checksum 64 (which has not been encrypted and is thus "in the clear"), and is input into an encoding function 29. The encoding

function 29 then encodes the input checksum 64 and encrypted string 67 into a machine readable symbol, which is printed by the printer 30 onto the document 10. As mentioned above, optional text 16 and/or graphics 18 may also be printed onto the document 10 along with the machine readable code 12, if desired by the vendor.

FIG. 7 illustrates the logic flow implemented by the preferred embodiment of the present invention as thus described. That is, at step 202, the data string (which may comprise the file location pointer, a launch command, user demographics, a source identification, an encryption key, and/or a code type) is operated on to compute a checksum at step 218. At step 220, the checksum is used as a key to encrypt the symbol data string. At step 222, the checksum and encrypted key are assembled together; at step 224 this assembled word is encoded into a machine readable symbol (such as a PDF417 two dimensional bar code symbol). The symbol is then printed onto the intelligent document 10 with optional text or graphics at step 226.

FIG. 3 illustrates in detail the processing of the client computer 32. The machine readable symbol 12 is scanned by the bar code scanner 34, and the scanned data is processed and decoded by block 36 as well known in the art. The decoded data is input to the de-obfuscation process 37 (described in detail below), or, if obfuscation has not been implemented in the system, to parsing block 39 as shown by the dotted line.

De-obfuscation is the reverse process of obfuscation, and is shown in detail in FIG. 4. The decoded input string from decoder 36 is parsed into two constituent components; the checksum 64, and the encrypted string 67. The checksum 64 is utilized as a decryption key along with decryption logic 97 (which is the parallel process of encryption logic 66) to produce a decrypted data string that is comprised of a file location pointer 21, launch command 22, user demographics 23, source identification 24, encryption key 25, and code type 26. A checksum of this decrypted data string is then computed by checksum compute block 99, and compared by compare block 101 to the checksum 64 that was received in the clear. When the comparison is successful, then a valid condition is indicated on the go/no go line 103. Conversely, when the comparison is not successful (the computed checksum is not equal to the received checksum), then an invalid condition is indicated on the go/no go line 103.

The logic flow of the de-obfuscation function is illustrated in FIG. 8. At step 208, the bar code symbol is scanned by the user. At step 218, the decoded input data string is parsed to obtain the checksum, which is utilized at step 220 as a key to decrypt the remaining portion of the string (the encrypted data string). At step 222, the checksum of the decrypted string is computed, and at step 224, it is compared to the received checksum. Decision block 226 directs the flow to step 228 when an invalid data condition is detected (i.e. the checksum comparison is unsuccessful), and the routine exits at step 230. Decision block 226 likewise directs the flow to step 232 when a valid data condition is detected (i.e. the checksum comparison is successful). When successful, a code type 76 (see FIG. 3) is fetched from memory 70 at step 234, and then compared via comparator function 78 at step 236 to the code type that was in the received (decrypted) data string. When no match is found, an invalid data condition is indicated at step 228, and the routine exits at step 230. When a code type match is found, then the decrypted string is unpacked at step 238 for further processing.

With reference to FIG. 3, once the de-obfuscation process 37 is determined to be successful and the code match is

valid, then the file location pointer 21 and source identification data 24 is loaded to a file transfer request word for subsequent loading to the Internet browser 40, LAN interface 96, or local memory 94, depending on the location of the file to be fetched. The file transfer request word may also be loaded with client version data 72, which indicates to the server which version of the client software is requesting the file.

The source identifier data string 24 that is parsed from the decoded (and de-obfuscated) scanned data string may comprise data correlated to the user (or expected user) of the intelligent document 10. As described below with reference to FIG. 5, the source identifier (source id) string will be used to access a lookup table to determine a decryption key associated with the file access, so that the target server may decrypt certain (encrypted) user information received from the client computer as part of the file transfer request word.

Local user data 74, such as the user's credit card number, is stored in memory 70 and accessed by the client computer for inclusion in the file transfer request word 90 after being encrypted by encryption block 80. That is, when it is desired to transit sensitive user data such as the user's credit card number to the target server computer 46 over the Internet 44, then the encryption block 80 will encrypt the user data by using the encryption key 25 that was obtained from the received data string. In addition, certain user demographics data 23 may be included in the data string 20 (see FIG. 2), which may be correlated to a user (or expected user) of the document 10. This user demographics data could then also be encrypted with encryption block 80 utilizing encryption key 25 to produce encrypted user information 82, for inclusion in the file transfer request word 90.

Optionally, if a launch command 22 was included in the data string 20, then it could be used to execute or launch the designated application. For example, the launch command 22 could cause a word processing program to open and fetch the target file from local memory 94. Likewise, the launch command 22 could execute an Internet browser program 40, so that the file transfer request word 90 would cause the browser to request the appropriate file over the Internet 44.

The logical flow of this process is shown in FIG. 9. At step 240, the user data is taken from memory 70 and encrypted, optionally along with user demographics data obtained from the scanned and de-obfuscated bar code symbol to produce encrypted user information 82. At step 248, the file transfer request 90 is assembled from the encrypted user information (step 242), the file location pointer (optionally comprising the IP address and file identifier) 21 and the source identifier data 24 that are obtained from the scanned and de-obfuscated bar code symbol (step 244), and the client version 72 fetched from memory 70 (step 246). The browser and/or other client application is launched at step 250, and at step 252 the file transfer request is transmitted over the Internet (or LAN) to the target server computer.

With reference to FIGS. 5 and 10, the operation of the target server computer 46 upon receiving the file transfer request will now be described. At step 254, the target server computer 46 receives the file transfer request, for example from the Internet 44. In the Internet example, the target server computer 46 is located at "IP ADDR" (Internet protocol address), via means well known in the art. A web server process 112 is executing on the target server computer 46, which at step 256 uses the source identifier string from the file transfer request to fetch a decryption key from key table 110. That is, for each particular source ID, there exists a decryption key mapped thereto that is complementary to

the encryption key **80** utilized by the client computer to encrypt sensitive user information prior to assembly into the file transfer request. The decryption key is then used at step **258** to decrypt the encrypted user information with decryption process **114** to obtain user file **122**. Optionally, an external key server **116**, which may be interconnected to the Internet, is used to obtain the decryption key. The decrypted user file is then stored in the secure customer data memory **52**, and the user request is tracked in the user log along with the date and time **120** of the request.

As shown in step **262**, if a pre-existing file (i.e. a static web page) was requested, then the file is obtained from storage **50**, wherein the location is a function of the file identifier (ID) taken from the file location pointer. In this event, the file is fetched from the appropriate location at step **268** and returned to the client computer via the Internet at step **270**. The file is then displayed on the client browser at step **272**.

If, however, a static page was not requested, but a dynamic page must be generated, then the dynamic page is generated at step **266**, for example as a function of the user data and file ID. This could occur where the file to be returned is customized to a user in accordance with is or her identifying indicia. The generated page is then returned to the client browser via the Internet as described above.

Alternatively, the requested file may be located on an external file server, which may be accessed by file generation and storage means **50** for return thereto or for direct forwarding to the client computer via the Internet, as shown by the dotted line in FIG. 5.

What is claimed is:

1. A method for a client computer to retrieve a computer file comprising the steps of:

- a) encoding a symbol data string comprising a file location pointer into a machine readable symbol;
- b) rendering said machine readable symbol within a data carrier;
- c) transposing an input data string from said machine readable symbol with a computer input device coupled to said client computer;
- d) parsing said input data string to determine said file location pointer; and
- e) utilizing said file location pointer to request the computer file designated thereby, by assembling a computer file transfer request word comprising said file location pointer, and transmitting said computer file transfer request word to a target server computer via a computer network system;
- f) said target server computer receiving said computer file transfer request word and
- g) said target server computer transmitting a computer file to said client computer in response thereto; wherein said machine readable symbol also has encoded therein a source identifier data string, said source identifier data string comprising data correlated to an expected user of said data carrier, and wherein said source identifier data string is transposed by said computer input device.

2. The method of claim 1 wherein said computer network system is an Internet, and wherein said computer file transfer request word is directed towards a target server computer in communication with the Internet.

3. The method of claim 2 wherein said file location pointer comprises a uniform resource locator (URL) for specifying a file on the target server computer in communication with the Internet.

4. The method of claim 1 wherein said file location pointer comprises a network address associated with said target server computer and a file identifier correlated to the computer file requested by said client computer.

5. The method of claim 1 wherein said source transposed source identifier data string is assembled within said computer file transfer request word and transmitted to said target server computer.

6. The method of claim 5 wherein said target server computer stores said source identifier data string received from said client computer in said computer file transfer request word.

7. The method of claim 5 wherein said machine readable symbol also has encoded therein an encryption key associated with said source identifier data string,

said encryption key is transposed by said computer input device,

said transposed encryption key is used by said client computer to encrypt information specific to a user associated with said client computer, and

said encrypted user information is assembled within said computer file transfer request word and transmitted to said target server computer.

8. The method of claim 7 wherein said information specific to a user is obtained, prior to encryption thereof, from a user information data file stored on said client computer.

9. The method of claim 7 wherein

said machine readable symbol also has encoded therein user demographics data,

said user demographics data correlated to a targeted user of said data carrier,

said user demographics data is transposed by said computer input device, and wherein

said information specific to a user is obtained, prior to encryption thereof, from said transposed user demographics data.

10. The method of claim 7 wherein

said target server computer utilizes said source identifier data string to access a lookup table to determine a decryption key associated with said encryption key, and said target server decrypts said encrypted user information received from said client computer.

11. The method of claim 10 wherein said lookup table is stored locally on said target server computer.

12. The method of claim 10 wherein said lookup table is stored remotely on a secondary server computer.

13. The method of claim 10 wherein said user information comprises a credit card number associated with said user of said client computer, and wherein on online electronic commercial transaction is accomplished by utilizing said credit card number.

14. A method for a client computer to retrieve a computer file comprising the steps of:

- a) encoding a symbol data string comprising a file location pointer into a machine readable symbol;
- b) rendering said machine readable symbol within a data carrier;
- c) transposing an input data string from said machine readable symbol with a computer input device coupled to said client computer;
- d) parsing said input data string to determine said file location pointer; and
- e) utilizing said file location pointer to request the computer file designated thereby, by

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assembling a computer file transfer request word comprising said file location pointer, and transmitting said computer file transfer request word to a target server computer via a computer network system;

- f) said target server computer receiving said computer file transfer request word and
- g) said target server computer transmitting a computer file to said client computer in response thereto;

wherein said machine readable symbol also has encoded therein user demographics data, said user demographics data correlated to a targeted user of said data carrier, and wherein said user demographics data is transposed by said computer input device.

15. The method of claim 14 wherein said user demographics data is included in said file transfer request word transmitted to said target computer, and wherein said user demographics data is stored in said target server computer.

16. The method of claim 15 wherein said computer file transmitted by said target server computer to said client computer is at least partially determined by at least part of said user demographics data.

- 17. A computer system comprising:

- a) a client computer interconnected to a computer network comprising a target server computer associated therewith, and

- b) a computer input device coupled to said client computer, adapted to read a machine readable symbol from a data carrier and transmit to said client computer an input data string;

wherein said client computer comprises

- processing means for transposing said input data string to a plurality of constituent fields, said fields comprising at least a file location pointer;

- means for utilizing said file location pointer to request the computer file designated thereby; comprising

- means for passing said file location pointer to an application program on said client computer suitable for processing the corresponding computer file;

- means for the application program to retrieve the computer file from the specified file location;
- means for assembling a computer file transfer request word comprising said file location pointer, and

- means for transmitting said computer file transfer request word to said target server computer via said network;

wherein said target server computer comprises:

- means for receiving said computer file transfer request word; and

- means for transmitting a computer file to said client computer in response to said computer file transfer request word;

wherein said input data string fields also comprise a source identifier data string, said source identifier data string comprising data correlated to an expected user of said data carrier.

18. The computer system of claim 17 wherein said computer network is an Internet, and wherein said computer file transfer request word is directed towards a target server computer in communication with the Internet.

19. The computer system of claim 18 wherein said file location pointer comprises a uniform resource locator (URL) for specifying a file on the target server computer in communication with the Internet.

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20. The system of claim 17 wherein said assembling means also assembles said source identifier data string within said computer file transfer request word.

21. The computer system of claim 20 wherein said target server computer further comprises means for storing said source identifier data string received from said client computer in said computer file transfer request word.

22. The computer system of claim 20 wherein said input data string fields also comprise an encryption key associated with said source identifier data string, and wherein said client computer further comprises means for encrypting with said encryption key a user information data file stored on said client computer, said user information data file comprising information regarding the user associated with said client computer, and

wherein said encrypted user information data file is assembled within said computer file transfer request word and transmitted to said target server computer.

23. The computer system of claim 22 wherein said client computer comprises memory means for storing a user information data file, and wherein said information specific to a user is obtained, prior to encryption thereof, from said user information data file.

24. The computer system of claim 22 wherein said input data string fields also comprise user demographics data correlated to a targeted user of said data carrier, and wherein said information specific to a user is obtained, prior to encryption thereof, from said user demographics data.

25. The computer system of claim 22 wherein said target server computer comprises

- means for accessing a lookup table, said lookup table for storing a decryption key associated with said source identifier data string, to obtain said decryption key associated with said source identifier data string, and means for decrypting, utilizing said decryption key, said encrypted user information received from said client computer.

26. The computer system of claim 25 wherein said lookup table is stored locally on said target server computer.

27. The computer system of claim 25 wherein said lookup table is stored remotely on a secondary server computer.

28. The computer system of claim 25 wherein said user information comprises a credit card number associated with said user of said client computer, and wherein said client computer further comprises means for executing an online electronic commercial transaction by utilizing said credit card number.

- 29. A computer system comprising:

- a) a client computer interconnected to a computer network comprising a target server computer associated therewith, and

- b) a computer input device coupled to said client computer, adapted to read a machine readable symbol from a data carrier and transmit to said client computer an input data string;

wherein said client computer comprises

- processing means for transposing said input data string to a plurality of constituent fields, said fields comprising at least a file location pointer;

- means for utilizing said file location pointer to request the computer file designated thereby; comprising

- means for passing said file location pointer to an application program on said client computer suitable for processing the corresponding computer file;

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means for the application program to retrieve the
 computer file from the specified file location;
 means for assembling a computer file transfer
 request word comprising said file location
 pointer, and
 means for transmitting said computer file transfer
 request word to said target server computer via
 said network;
 wherein said target server computer comprises:
 means for receiving said computer file transfer
 request word; and
 means for transmitting a computer file to said client
 computer in response to said computer file transfer
 request word;

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wherein said input data string fields also comprise user
 demographics data correlated to a targeted user of
 said data carrier.

30. The computer system of claim **29** wherein said user
 demographics data is included in said file transfer request
 word transmitted to said target computer, and wherein said
 target server computer comprises means for storing said user
 demographics data.

31. The computer system of claim **30** wherein said target
 server computer comprises means for utilizing said user
 demographics data to at least partially determine the com-
 puter file transmitted by said target server computer to said
 client computer.

• • • • •

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: Jeffry Jovan Philyaw
Serial No.: 09/602,034
Confirmation No.: 9028
Filed: June 23, 2000
Group: 2157
Examiner: LaShonda T. Jacobs
For: CONTROLLING A PC USING A TONE FROM A CELLULAR
TELEPHONE

Mail Stop AF
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

AMENDMENT AFTER FINAL AND RESPONSE TO OFFICE ACTION

This communication is responsive to the Examiner's Office Action mailed November 16, 2006.

Amendments to the Claims are reflected in the listing of claims beginning on page 2 of this paper.

Remarks/Arguments begin on page 6 of this paper.

In the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended): A method for accessing information over a network from a remote location on the network for delivery to a user PC, comprising the steps of:

providing a functional mode on a cellular telephone for web access over the network, the cellular telephone separate from the user PC and the functional mode having associated therewith a unique code;

associating at least a button on the cellular telephone with the functional mode;

activating the button on the cellular telephone to activate the functional mode when the user is in physical proximity to the user PC and, in response thereto, transferring to the user PC unique code, which unique code has no routing code contained therein that would by itself uniquely identify the location of the remote location on the network, but which unique code has a predetermined association with the remote location; and

in response to activation of the functional mode, the user PC then utilizes the unique code received from the cellular telephone and the predetermined association thereof with the remote location to access information from the remote location on the network for delivery to the user PC and display thereof on a display associated with the user PC;

such that the user PC is controlled in accordance with the unique code to access ~~the predetermined remote location~~; the predetermined remote location;

wherein the step of providing the functional mode comprises storing the unique code in the cellular telephone, which unique code is associated in the step of associating with the button, such that the unique code is output as a function of activation of the button in the step of activating for delivery to the user PC in the step of controlling.

2. (Cancelled)

3. (Cancelled)

4. (Currently Amended): The method of Claim [[3]]1, wherein the step of activating comprises transmitting the unique code to the user PC and the user PC further

AMENDMENT AND RESPONSE

S/N 09/602,034

Atty. Dkt. No. PHLY-25,337

including the step of receiving the unique code from the cellular telephone and, in response thereto, accesses the information from the remote location on the network.

5. (Original): The method of Claim 4, wherein the step of transmitting comprises transmitting via a wireless mode.

6. (Original): The method of Claim 5, wherein the step of transmitting via the wireless mode includes transmitting via an optical link.

7. (Currently Amended): The method of Claim [[3]] 1, wherein the step of controlling the user PC further comprises the steps of:

receiving the unique code;

transmitting the unique code to an intermediate node on the network;

5 providing a relational database at the intermediate node on the network having contained therein a relational table between one or more unique codes and corresponding location information of the network;

10 comparing the unique code transmitted to the intermediate node with location information that resides in the informational database and, if there is a match, transmitting the matched location information back to the user PC; and

connecting the user PC to the remote location in accordance with the matched location information returned thereto from the intermediate node.

8. (Original): The method of Claim 4, wherein the step of transmitting comprises transmitting an audio signal wherein the step of receiving comprises receiving and detecting the audio signal and extracting the information in the unique code therefrom.

9. (Original): The method of Claim 1, wherein the network is a global communication network.

10. (Currently Amended): An apparatus for accessing information over a network from a remote location on the network for delivery to a user PC;

5 a cellular telephone for providing a functional mode for web access over the network, the cellular telephone separate from the user PC, the functional mode having associated therewith a unique code;

AMENDMENT AND RESPONSE

S/N 09/602,034

Atty. Dkt. No. PHL Y-25,337

at least a button on said cellular telephone associated with said functional mode;

wherein said button on said cellular telephone is activated to initiate said functional mode when the user is in physical proximity to the user PC and transfer to the user PC the unique code, which unique code has no routing information contained therein that would by itself uniquely identify the location of the remote location on the network, but which unique information has a predetermined association with the remote location; and

wherein, in response to activation of the functional mode, the user PC utilizes said unique code received from this cellular telephone and the predetermined association thereof with the remote location to access information from the remote location on the network for delivery to the user PC and display thereof of said information on a display associated with the user PC;

such that the user PC is controlled in accordance with said unique code to access ~~said predetermined remote location~~; said predetermined remote location; and

wherein the unique code is stored in said cellular telephone, which said unique code is associated with said button, such that said unique code is output to the user PC as a function of activation of said button.

11. (Cancelled)

12. (Cancelled)

13. (Currently Amended): The apparatus of Claim ~~[[12]]~~ 10, wherein the unique code is transmitted to the user PC, and the user PC said unique code is received from said cellular telephone and, in response thereto, said information from said remote location on the network is accessed.

14. (Original): The apparatus of Claim 13, wherein said unique code is transmitted via a wireless mode.

15. (Original): The apparatus of Claim 14, wherein said unique code is transmitted via an optical link.

16. (Currently Amended): The apparatus of Claim [[12]] 10, wherein the user PC is controlled to receive said unique code, and to transmit said unique code to an information system on the network, said information system on the network comprising:

an intermediate node which receives the unique code; and

5 a relational database at said intermediate node having contained therein a relational table between one or more said unique codes and corresponding location information of the network;

10 wherein said unique code which is transmitted to said intermediate node is compared with said location information that resides in said relational database and, if there is a match, transmitting said matched location information back to the user PC;

wherein the user PC is connected to said remote location in accordance with said matched location information returned thereto from said intermediate node.

17. (Original): The apparatus of Claim 13, wherein an audio signal is transmitted to the user PC, which user PC receives and detects said audio signal, and extracts said unique code therefrom.

18. (Original): The apparatus of Claim 10, wherein the network is a global communication network.

19. (Cancelled)

20. (Cancelled)

21. (Previously Presented) The method of claim 1, wherein the cellular telephone has a communication mode to allow voice communication where the cellular telephone communicates via a cellular telephone network and the step of transferring to the user PC the unique code occurs over a separate communication link between the user PC and the cellular
5 telephone.

22. (Previously Presented) The apparatus of claim 10, wherein the cellular telephone has a communication mode to allow voice communication where the cellular telephone communicates via a cellular telephone network and the cellular telephone is operable to transfer to the user PC the unique code over a separate communication link between the user
5 PC and the cellular telephone.

AMENDMENT AND RESPONSE

S/N 09/602,034

Atty. Dkt. No. PHL Y-25,337

REMARKS

Applicant has carefully reviewed the Office Action dated November 16, 2006. Applicant has amended Claims 1, 4, 7, 10, 13, and 16 to more clearly point out the present inventive concept. Applicant has cancelled Claims 3 and 12. Reconsideration and favorable action is respectfully requested.

Claim 1 stands rejected on the ground of non-statutory double patenting in view of Claim 1 of U.S. Patent No. 6,985,954, as the Examiner considers the claims, if allowed, to improperly extend the "right to exclude" already granted in the patent. A terminal disclaimer, in accordance with 37 CFR 1.321(c), is attached herewith.

Applicant notes with appreciation the Examiner's indication that Claims 3-4, 7, 12-13, and 16 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Claim 1 has incorporated the limitations of Claim 3 and Claim 10 has incorporated the limitations of Claim 12. Therefore, Applicant believes that all of the currently presented claims are in condition for allowance.

Applicant has now made an earnest attempt in order to place this case in condition for allowance. For the reasons stated above, Applicant respectfully requests full allowance of the claims as amended. Please charge any additional fees or deficiencies in fees or credit any overpayment to Deposit Account No. 20-0780/PHLY-25,337 of HOWISON & ARNOTT, L.L.P.

Respectfully submitted,
HOWISON & ARNOTT, L.L.P.
Attorneys for Applicant

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November 22, 2006

AMENDMENT AND RESPONSE

S/N 09/602,034
Atty. Dkt. No. PHLY-25,337

14 of 167 DOCUMENTS

ABBOTT LABORATORIES, Plaintiff-Appellant, v. SYNTRON BIORESEARCH, INC., Defendant-Cross Appellant.

02-1203, 02-1257

UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

334 F.3d 1343; 2003 U.S. App. LEXIS 13825; 67 U.S.P.Q.2D (BNA) 1337

July 10, 2003, Decided

SUBSEQUENT HISTORY: Rehearing denied by *Abbott Labs. v. Syntron Bioresearch, Inc.*, 2003 U.S. App. LEXIS 17605 (Fed. Cir., Aug. 5, 2003)

PRIOR HISTORY: [**1] Appealed from United States District Court for the Southern District of California. Chief Judge Marilyn L. Huff.

Abbott Labs. v. Syntron Bioresearch, Inc., 2001 U.S. Dist. LEXIS 25125 (S.D. Cal., Oct. 12, 2001)

DISPOSITION: Affirmed in part, reversed in part and remanded.

COUNSEL: Lee Carl Bromberg, Bromberg & Sustein LLP, of Boston, Massachusetts, argued for plaintiff-appellant. With him on the brief were Joel R. Leeman and Eric Paul Belt. Of counsel on the brief were George C. Lombardi, Winston & Strawn, of Chicago, Illinois; and Regina M. Anderson, Office of the General Counsel, Abbott Laboratories, of Abbott Park, Illinois.

David C. Doyle, Morrison & Foerster LLP, of San Diego, California, argued for defendant-cross appellant. With him on the brief were Jill D. Neiman and Steven E. Comer. Of counsel was Peng Chen.

JUDGES: Before MAYER, Chief Judge, MICHEL and DYK, Circuit Judges.

OPINION BY: DYK

OPINION

[*1346] DYK, *Circuit Judge*.

Abbott Laboratories ("Abbott" or "appellant") appeals from the judgment of the United States District Court for the Southern District of California that Syntron Bioresearch, Inc. ("Syntron" or "appellee") did not in-

fringe the asserted claims of *United States Patent Nos. 5,073,484* ("the '484 patent") and 5,654,162 ("the '162 patent"). *Abbott Labs. v. Syntron Bioresearch, Inc.*, 2001 U.S. Dist. LEXIS 25125, No 98-CV-2359 (S.D. Cal. Oct. 12, 2001) ("Judgment"). [**2] Syntron cross-appeals from the judgment that the asserted claims are not invalid.

We affirm the judgment of noninfringement as to claim 26 of the '484 patent and claims 1, 22, 29, and 30 of the '162 patent. We reverse the judgment of non-infringement as to claims 22 and 23 of the '484 patent, and remand as to those claims. We affirm the judgment that the asserted claims are not invalid.

BACKGROUND

I

Abbott is the exclusive licensee of the '484 and '162 patents (collectively "the patents-in-suit"), respectively entitled "Quantitative Analysis Apparatus and Method" and "Chemical Analysis Apparatus and Method." The written descriptions of the '484 and '162 patents are substantially identical, being generally directed to devices and methods for performing chemical analysis. The Field of the Invention sections of both patents described the technical field disclosed in the patents as follows:

The invention is in the field of quantitative chemical analysis, and is particularly useful in the detection and analysis of small amounts of chemical substance in such biological fluids as milk, blood, urine, etc.

[*1347] '484 patent, col. 1, II. 10-13. ¹

1 In view of the substantial identity between the written descriptions of the two patents, citation will be made to the '484 patent as exemplary of both patents-in-suit.

[[*3] The technology at issue involves the reaction of three chemical constituents: a substance to be detected (called an analyte, ligand, or antigen), a substance that is complementary to and binds to the substance to be detected (called a reactant or antibody), and an indicator (called a detector), which also binds to the substance to be detected. The patents are particularly directed to chemical analysis related to the immune system and its reactions. Proteins produced by the immune system bind to particular foreign substances as a natural defense mechanism. The technology at issue here exploits the ability of the immune system to create proteins (antibodies or reactants) that bind with particularity to a substance to be detected (ligand or analyte). The indicator and the reactant bind to the analyte. The reactant immobilizes the analyte, and the indicator provides an indication of the presence of the analyte. The indication can be one of two types, a qualitative indication or a quantitative indication. Qualitative analysis provides an indication of the presence or absence of the analyte in the sample. A quantitative indication provides information about the quantity of the analyte present [[*4] in the test sample. In the disclosed invention quantitative analysis is performed using a device that includes a number of analyte detection zones, wherein the number of zones in which analyte is detected is directly proportional to the amount of analyte in the sample.

An exemplary embodiment of a test device as shown in figure 5 of the '484 patent is reproduced below. The test device includes a test medium comprised of a filter paper strip (40) that permits a liquid test sample to flow downward therethrough. The test medium contains reaction zones (40.1), which include therein reactant, bound to the medium within the reaction zones. As the test solution flows through the reaction zone, the reactant bound therein reacts by binding with the analyte (if any) present within the test sample. An indicator also reacts with the analyte (e.g., by binding therewith), thus providing a "moicity derived from [the] analyte, and desirably . . . a tagged or labeled form of the analyte" called an "analyte derivative" that functions as an indication of the presence of the analyte.

SEE ILLUSTRATION IN ORIGINAL

In operation, the liquid sample is applied to the test strip and flows downward. [[*5] The labeled or tagged analyte in the liquid sample is trapped by the reactant in the test zones. The label or tag associated with the analyte provides an indication of the analyte. The number of zones within which analyte is indicated provides a meas-

urement of the concentration of the analyte within the liquid sample.

II

On December 30, 1998, Abbott filed a complaint for patent infringement against Syntron alleging infringement of both patents-in-suit and seeking damages and a permanent injunction. At trial the allegations of infringement were narrowed to claims 22, 23, and 26 of the '484 patent (of [*1348] which claims 22 and 26 are independent) and claims 1, 22, 29, and 30 of the '162 patent (of which claims 1 and 22 are independent). Claim 22 of the '484 patent is exemplary of the asserted claims of that patent, and provides:

A method for the analysis of an analyte which is a member of a ligand-antiligand binding pair in a test solution comprising the steps of:

(a) providing a non-diffusively immobilized reactant in each of one or more reaction zones spaced successively along a flow path defined by a liquid permeable medium, wherein said reactant is the other member of said binding [[*6] pair and is capable of binding with the analyte to form a predetermined product;

(b) flowing said solution along the medium and sequentially through the reaction zone(s); and

(c) detecting the presence of analyte, said reactant or said predetermined product in the reaction zone(s), wherein the number of zones in which detection occurs is related to the presence of analyte in the solution.

Claim 1 of the '162 patent is exemplary of the asserted claims of that patent, and provides:

A device generating a signal indicative of the presence of an analyte in a liquid solution suspected of containing said analyte, said device comprising:

(a) a liquid permeable solid medium comprising a solution contact portion and one or more spaced reactive zones separated from said contact portion;

(b) a solution suspected of containing said analyte and having traversed said medium, including said reactive zone(s);

(c) a reactant non-diffusively bound to said medium only at said reactive zone(s), said reactant being specific for and bound to said analyte or a reaction product comprising said analyte and a chemical moiety; and

(d) a labeled antibody specific for and bound [**7] to said analyte or said reaction product in said reactive zone(s); wherein said device provides a detectable signal in said reactive zone(s) as an indication of the presence or absence of said analyte in said solution.

On January 4, 2001, the district court issued an order resolving disputed issues of claim construction. *Abbott Labs. v. Syntrol Bioresearch Inc.*, No. 98-CV-2359 (S.D. Cal. Jan. 4, 2001) ("Claim Construction Order"). On September 25, 2001, the district court issued an order adopting supplemental claim constructions. *Abbott Labs. v. Syntrol Bioresearch Inc.*, No. 98-CV-2359 (S.D. Cal. Sept. 25, 2001) ("Supplemental Claim Construction Order"). The constructions provided in the supplemental order were used as the basis for the jury instructions as to the claim terms "non-diffusively immobilized"; "non-diffusively bound"; "specific for"; "predetermined amount"; and "analyte."

On October 4, 2001, the jury returned a special verdict form finding the asserted claims of the patents-in-suit valid but not infringed. *Abbott Labs. v. Syntrol Bioresearch Inc.*, No. 98-CV-2359 (S.D. Cal. Oct. 4, 2001) ("Special Verdict"). The jury found with respect to all [**8] of the asserted claims that Abbott failed to prove that the accused products included a "non-diffusively immobilized" or "non-diffusively bound" reactant. *Id.* at 1-3. The jury found that Abbott failed to prove that the accused products included "a reactant bound [to the reaction zone] which is specific for . . . the analyte" as recited claims 1, 22, 29, and 30 of the '162 patent. *Id.* at 3. With respect to claim 26 of the '484 patent and claims 22, 29, and 30 of the '162 patent, the jury found that Abbott failed to prove that the accused products included "a predetermined amount of reactant" in the reaction [*1349] zone. *Id.* at 2-3. The jury also found with respect to claim 26 of the '484 patent that Abbott failed to prove that "detection occurs . . . only if analyte is present in the test solution in a predetermined amount." *Id.* at 2. As to validity and enforceability, the jury returned verdicts that Syntrol failed to prove by clear and convincing evidence that the claims were anticipated, obvious, invalid due to inventorship error, lacked enablement or written description support, or were unenforceable due to inequitable conduct. *Id.* at 4-7.

On October 12, 2001, the [**9] district court entered judgment in favor of Syntrol as to infringement and in favor of Abbott as to validity and unenforceability in accordance with the special verdict. *Abbott Labs. v. Syntrol Bioresearch Inc.*, No. 98-CV-2359 (S.D. Cal. Oct. 12, 2001) ("Judgment"). Following judgment, Abbott and Syntrol filed motions for JMOL and a new trial, which were denied. *Abbott Labs. v. Syntrol Bioresearch Inc.*, No. 98-CV-2359 (S.D. Cal. Jan. 10, 2002) ("Order Denying JMOL"). Abbott filed a timely appeal of the final judgment. Syntrol filed a timely cross-appeal. We have jurisdiction over the appeal and the cross-appeal under 28 U.S.C. § 1295(a)(1).

DISCUSSION

We review the jury's factual determinations for substantial evidence. *Union Carbide Chems. & Plastics Tech. Corp. v. Shell Oil Co.*, 308 F.3d 1167, 1177, 64 USPQ2d 1545, 1551 (Fed. Cir. 2002). This court reviews issues of claim construction and the propriety of jury instructions without deference. *Cybor Corp. v. FAS Techs., Inc.*, 138 F.3d 1448, 1456, 46 USPQ2d 1169, 1174 (Fed. Cir. 1998) (en banc). We review "[the] jury's conclusions on obviousness, a question [**10] of law, without deference, and the underlying findings of fact, whether explicit or implicit within the verdict, for substantial evidence." *LNP Engineering Plastics, Inc. v. Miller Waste Mills, Inc.*, 275 F.3d 1347, 1353, 61 USPQ2d 1193, 1197 (Fed. Cir. 2001).

I.

Abbott requests review of the jury findings as to four claim recitations: "non-diffusively bound"; "non-diffusively immobilized"; "specific for"; and "predetermined amount." Abbott argues that under the proper claim construction the judgment of noninfringement cannot stand and that judgment of infringement should be entered in its favor or, alternatively, a new trial should be granted.

We must sustain the judgment of noninfringement as to an asserted claim if any one of the noninfringement findings as to that claim is based on proper jury instructions and is supported by substantial evidence. See *Teleflex, Inc. v. Ficosa N. Am. Corp.*, 299 F.3d 1313, 1328, 63 USPQ2d 1374, 1383 (Fed. Cir. 2002). Thus, in order to prevail as to a particular claim, Abbott must establish as to each ground of noninfringement that either (1) the jury instruction as to that element was erroneous and prejudicial, [**11] *Ecolab Inc. v. Paraclipse, Inc.*, 285 F.3d 1362, 1373, 62 USPQ2d 1349, 1356 (Fed. Cir. 2002); or (2) the jury verdict was not supported by substantial evidence. *Cybor*, 138 F.3d at 1454, 46 USPQ2d at 1172.

A. Non-Diffusively Bound and Non-Diffusively Immobilized

Abbott argues that the jury's finding of noninfringement based on the failure to satisfy the claim terms "non-diffusively bound" and "non-diffusively immobilized" is not sustainable because of error in the jury instruction.

All of the asserted claims require a reactant that is either "non-diffusively bound" or "non-diffusively immobilized." The parties agree that these recitations as properly [*1350] construed have the same meaning. The district court adopted, and instructed the jury using the following definition of "non-diffusively bound":

Nondiffusively bound means a reactant immobilized in the reaction zone so as to provide a detectable signal indicating the presence or absence of analyte in the solution, and the reactant is not capable of detaching from the medium, spreading out, and moving along the test strip . . . [A] reactant is nondiffusively bound *only if it is found in* [**12] *such a manner that a sufficient and reproducible amount of reactant remains bound in the reactive zone or zones to conduct both quantitative and qualitative assays.*

(Tr. at X-132.) Abbott objected to the district court's construction, urging instead that the disputed recitations "require only that the reactant be immobilized sufficiently to permit detection of the analyte in the reaction zone." (Appellant's Br. at 25.).

On appeal Abbott urges that the adoption of an instruction including the underscored language was error because it interpreted the claim to require quantitative analysis. Synttron urges that the inclusion of the "quantitative" language in the jury instruction was proper.

The first step in the analysis is to determine the ordinary meaning of the claim terms. *Tex. Digital Sys. v. Telegenix, Inc.*, 308 F.3d 1193, 1202, 64 USPQ2d 1812, 1817 (Fed. Cir. 2002); see also *Inverness Med. Switz. GmbH v. Warner Lambert Co.*, 309 F.3d 1373, 1378, 64 USPQ2d 1933, 1936 (Fed. Cir. 2002); *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582, 39 USPQ2d 1573, 1576 (Fed. Cir. 1996). Dictionary definitions provide evidence [**13] of a claim term's "ordinary meaning." *Inverness*, 309 F.3d at 1378, 64 USPQ2d at 1936. The parties have conceded that the recitations "non-diffusively bound" and "non-diffusively immobilized" are to be construed consistently. Starting with the words themselves, "non-diffusively" is an adverb defining the verbs "im-

mobilized" and "bound." Webster's defines "bound" as "held in chemical or physical combination: COMBINED." *Webster's Third International Dictionary* 260 (1968) ("*Webster's*"). Webster's defines "immobilize" as "to make immobile: fix in place or position: render incapable of movement." *Id.* at 1130. The plain meaning of "immobilized" requires that the reactant not move relative to the medium, and the recitation "bound" further defines how that immobilization is provided, by requiring that the reactant be chemically or physically combined with the medium so as to be immobilized.

"Diffusively" defines the degree or character of the recitations "bound" and "immobilized." "Diffusive", the adverb form of which is "diffusively", means "having the quality of diffusing: tending to diffuse; characterized by diffusion." *Id.* at 631. Webster's defines diffusion [**14] as "the process whereby particles (as molecules and ions) of liquids, gases, or solids intermingle as the result of their spontaneous movement caused by thermal agitation and in dissolved substances move from a region of higher concentration to one of lower concentration." *Id.* at 631 (emphasis added). Thus, a dissolved substance that moves diffusively moves from a region of high concentration to one of lower concentration within the liquid, i.e., disperses within the liquid.

Taking the words together, the plain meaning of "non-diffusively bound" and "non-diffusively immobilized" is - a chemical or physical combination of the reagent and the medium, such that the reagent does not dissolve and move within the liquid from a region of high concentration to a region of low concentration. This definition closely mirrors the first portion [*1351] of the construction adopted by the district court - the reactant is not capable of detaching from the medium, spreading out, and moving along the test strip - but bears no resemblance to the underscored portion of the instruction. None of the pertinent dictionary definitions supports the underscored portion. The plain meaning of the claim recitation, [**15] therefore, does not support the district court's narrowing construction.

The usage of the disputed claim terms in the context of the claims as a whole also informs the proper construction of the terms. See *RF Del., Inc. v. Pac. Keystone Techs., Inc.*, 326 F.3d 1255, 1263-64, 66 USPQ2d 1593, 1598 (Fed. Cir. 2003). Here, the language of the asserted claims suggests that quantitative analysis should not be read as a requirement of the recitations "non-diffusively bound" or "non-diffusively immobilized." In claim 22 of the '484 patent, for example, element (c) requires "detecting the presence of analyte." Similar language is found in each of the asserted claims. This language is broad enough to encompass both qualitative and quantitative analysis, and therefore, militates against the narrow definition used to instruct the jury. Synttron appears not to

argue to the contrary on appeal. Rather, Syntron urges that the underscored language, in fact, broadens rather than narrows the construction of "non-diffusively bound." (Appellee's Br. at 20.) According to Syntron, the jury instruction did not require "quantitative analysis," but rather defined the quality of binding between [*16] the reactant and the test strip. We cannot agree, as the language "sufficient and reproducible amount of reactant remains . . . to conduct both quantitative and qualitative assays" is an additional requirement beyond the ordinary meaning of the claim language.²

2 Syntron also cites the description of the disclosed invention in the specification as using "covalent bonding" between the reactant and the test strip as somehow supporting the district court's adopted jury instruction. (Appellee's Br. at 21-22.) The description in the specification of a particular embodiment does not require that the claims be limited to that embodiment. See *Brookhill-Wilk I, LLC v. Intuitive Surgical, Inc.*, 334 F.3d 1294, 2003 U.S. App. LEXIS 13861, No. 02-1145, slip op. at 12 (Fed. Cir. June 27, 2003).

Thus, the construction adopted by the district court and used to instruct the jury was erroneous insofar as it included the underscored language requiring a sufficient amount to conduct quantitative assays. Because we have found that the jury was improperly instructed, [*17] and Syntron does not argue that the instruction was harmless error, we cannot affirm the judgment of noninfringement on the basis of the accused products' not incorporating a "non-diffusively bound" and "non-diffusively immobilized" reactant. Abbott urges that we enter JMOL in its favor instead of ordering a new trial. However, we think the issue of whether JMOL or a new trial should be granted is an issue best addressed in the first instance by the district court. Moreover, we must determine whether the judgment of noninfringement as to any of the claims can be sustained on other grounds.

B. Specific For

The jury also found noninfringement of claims 1, 22, 29, 30 of the '162 patent because it concluded that the accused device did not meet the "specific for" claim recitation. Abbott urges that the district court's construction of "specific for" was in error, and that JMOL of infringement in its favor as to those elements should have been entered or a new trial granted. Abbott urges that the jury instruction included two errors, the inclusion of the language "particular to" in the instruction and the failure to instruct the jury that the [*1352] claim language "does not mean that the reactant [*18] must bind only one analyte." (Appellant's Br. at 50-52.)

As to the first assigned error, the inclusion of the language "particular to," Abbott waived this argument by agreeing to that portion of the adopted construction. The jury instruction for "specific for" stated that the term meant "particular to and capable of binding with the analyte or chemical moiety of interest." (Tr. at X-133.) The district court further stated that "particular to means capable of preferentially reacting or binding with the analyte or chemical moiety from among the thousands of molecules potentially in the test sample." *Id.* The disputed phrase was present in the proposed jury instructions submitted by Abbott.³ (J.A. at 8006.) Abbott also stated during trial "the Court has defined [specific to] to mean particular to and capable of binding with the analyte of interest, and the Plaintiff believes that that . . . claim term is properly defined." (Tr. at VIII-212.) Abbott cannot wait until after the jury returns a verdict against it and then on JMOL request a different construction by attempting to have the district court delete a portion of the construction that Abbott itself agreed to. See *Interactive Gift Express, Inc. v. Compuserve Inc.*, 256 F.3d 1323, 1345-46, 59 USPQ2d 1401, 1418 (Fed. Cir. 2001) [*19] (holding that the presentation of the adopted construction to the district court constituted a waiver, precluding the party from proposing a new construction either on JMOL or on appeal). Abbott, therefore, cannot assign error to the district court's use of a definition including the language "particular to." The jury in reaching its verdict was bound by the district court's instruction constraining the claims. The jury was not charged with the task of reaching a new claim construction through review of the sources used in interpreting the claims such as dictionaries, the specification, or the prosecution history.

3 Abbott's proposed jury instruction provided in full:

"specific for" means "particular to and capable of binding with." The words "particular to" do not mean that the reactant (e.g., and antibody) will bind one and only one analyte. Rather, "particular to" means the reactant is capable of preferentially reacting or binding with the analyte (or the reaction product of the analyte with another chemical moiety) from among the thousands of molecules potentially in the test sample. The reactant may also bind with other related molecules that share common structures.

(J.A. at 8006 (emphasis in original).)

[**20] Regarding the second error urged by Abbott - the failure to instruct the jury that "particular to" does not mean that the reactant must bind only one analyte" - the instruction adopted by the district court implicitly incorporated this portion of the proposed instruction. Specifically, the jury instruction stated that "particular to means capable of *preferentially* reacting or binding with." (Tr. at X-133) (emphasis added). The jury instruction did not require that the reaction occur solely with the analyte, but rather that the reaction with the analyte be the preferred reaction. Thus, the additional language urged by Abbott was redundant of language that it also proposed and which the court used to instruct the jury. There was no error, therefore, in failing to instruct the jury that "particular to" does not mean that the reactant must bind only one analyte."

In addition to errors in the jury instruction, Abbott also argues that substantial evidence does not support the jury verdict and that judgment of infringement is required under the district court's instruction. Even where a party proposes the adopted instruction, that party is not estopped from arguing that the jury failed [**21] to properly apply that instruction. *Moba, B.V. v. Diamond Automation, Inc.*, 325 F.3d 1306, 1314, [*1353] 66 USPQ2d 1429, 1434 (Fed. Cir. 2003). In *Moba* the district court refused to grant JMOL based on the jury's implicit interpretation of the agreed-upon claim construction. *Id.* On appeal, *Moba* argued that because Diamond had agreed to the construction used to instruct the jury, it was estopped from contesting the verdict. *Id.* This court reversed, holding that Diamond was not so estopped because it was simply arguing that there was a lack of substantial evidence to support the verdict under the district court's own instructions. *Id.* As the court explained, "Diamond [did] not wish to alter the district court's claim construction on appeal, but [sought] enforcement of the trial court's claim construction." *Id.*

Here, under the district court's claim construction, the jury found that the accused devices did not include "a reactant . . . which is specific for . . . the analyte." The undisputed evidence showed that the reactant employed in the accused devices binds identically to the analyte (human chorionic gonadotropin - "hCG") and to another protein called [**22] luteinizing hormone ("LH") that possesses an identical protein binding site to that of hCG. *Order Denying JMOL* at 23. The agreed upon claim construction, however, required the reagent to be "capable of *preferentially reacting or binding with the analyte . . . from among the thousands of molecules potentially in the test sample.*" (Tr. at X-133.) The undisputed fact, as admitted by Abbott's own witness, is that the reactant employed by Syntrol in the accused devices binds *identically* with the analyte (hCG) and another substance (LH).

(Tr. at III-116). Thus, the jury could have reasonably concluded that the reagent did not *preferentially* bind with the analyte from among the thousands of molecules. The issue here is solely whether the jury could have reasonably concluded that the reagent did not meet the recitation as construed by the district court in the instructions. We conclude that it could have. On this ground, therefore, we affirm the judgment of noninfringement as to claims 1, 22, 29, 30 of the '162 patent.

C. Predetermined Amount ⁴

4 The claim language "predetermined amount" is recited in a number of claims. However, only claim 26 of the '484 patent is addressed in this section, as the verdicts of noninfringement as to the remainder of the claims containing that language are being affirmed on other grounds.

[**23] The jury found noninfringement of claim 26 of the '484 patent, concluding that the accused device did not meet the "predetermined amount" claim recitation. The district court defined "predetermined amount" as "an amount determined beforehand" and instructed the jury accordingly. (Tr. at X-133.) Abbott does not challenge the instruction as such (having agreed to the instruction at trial), but for purposes of JMOL seeks to interpret the claim language more broadly, i.e., "the amount of analyte or bound reactant need not be precisely known or reproducible." (Appellant's Br. at 37.) As we have discussed above, Abbott cannot seek to modify an agreed claim construction on appeal. See *Interactive Gift Express*, 256 F.3d at 1345-46, 59 USPQ2d at 1418.

The jury found that the accused devices did not include an "an amount determined beforehand" as required under the construction adopted for this recitation. *Special Verdict* at 2-3. The district court refused to grant JMOL that Syntrol infringed this limitation. *Order Denying JMOL* at 28. As stated by the district court:

The record suggests that the amount of bound antibody [in the accused devices] is unknown [**24] and variable from test to test. . . . [*1354] Syntrol's manufacturing process merely involves placing the 1001 capture antibody solution on the test strip, and "eyeballing" it to make sure that the solution is on it.

Id. at 29. Based on this evidence the district court concluded that a reasonable jury could have found that the amount of reactant was not determined beforehand. ⁵ *Id.* We agree with the district court that a reasonable jury could have found that the amount of reagent was not

determined beforehand. Thus, we affirm the judgment of noninfringement as to claim 26 of the '484 patent.

5 On appeal Abbott cites testimony from one of Syntron's witnesses purporting to prove that the amount of reagent is determined in advance. (Appellant's Br. at 40.) That testimony, however, was in response to the following question: "isn't it true that Syntron controls the amount of each ingredient that you use in the production of your antibody solution?" (Tr. at VIII-69) (emphasis added). The cited testimony, therefore, was directed to the amount of reagent incorporated in the solution to be applied to the test strip, and not the amount of reagent that is placed on the test strip.

[**25] D. Analyte

Syntron seeks to alternatively support the judgment of noninfringement as to claims 22 and 23 of the '484 patent based on the argument that the district court's construction of the claim term "analyte" in those claims was erroneous, and that under the proper claim construction no reasonable jury could have found that the limitation was satisfied.

The district court construed "analyte" to mean "the substance of interest, i.e., the substance that the test is designed to detect if present in the liquid being tested." Syntron objected to this construction before the district court and urges on appeal that the district court should have instructed the jury that the "analyte" limitation required quantitative analysis. Syntron does not argue that the plain meaning of the word "analyte" requires quantitative measurement. Nor could it. Although the word "analyte" is not defined in general dictionaries of the English language, the term is used in specific fields of technology including analytical chemistry, and within that field is defined as the component of a sample that is to be determined. See, e.g., Douglas A. Skoog et al., *Fundamentals of Analytical Chemistry* [**26] 1 (7th ed. 1996) ("The components of a sample that are to be determined are often referred to as analytes."). This definition corresponds closely to the definition adopted by the district court, that is, "the substance that the test is designed to detect if present in the liquid being tested."

The law is clear, however, that a patentee may be his own lexicographer (see *Renishaw PLC v. Marposh Societa' per Azioni*, 158 F.3d 1243, 1249, 48 USPQ2d 1117, 1121 (Fed. Cir. 1998)), and Syntron argues that Abbott did so here, defining analyte to require quantitative analysis because the patentee explicitly defined the term in the specification as "any chemical moiety which is to be measured quantitatively." (Appellee's Br. at 40.). However, "the patentee's lexicography must, of course, appear 'with reasonable clarity, deliberateness, and precision'

before it can affect the claim." *Id.* (emphasis added) (quoting *In re Paulsen*, 30 F.3d 1475, 1480, 31 USPQ2d 1671, 1674 (Fed. Cir. 1994)). Thus, the issue is whether the patentee here defined "analyte" with reasonable clarity, deliberateness, and precession. The definition cited by Syntron is provided in the [**27] Summary of the Invention section of the patents-in-suit, and provides in its entirety:

As used herein, "analyte" refers not only to the particular chemical moiety for which analysis is desired, but also to chemical moieties that are reaction products [**1355] of the moiety to be determined with another chemical moiety. For example, a biological fluid containing an unknown amount of a chemical moiety may be reacted in solution or otherwise with another chemical moiety to provide a product, the concentration of which is related to the initial concentration of the chemical moiety to be measured. The resulting product, then, may become the "analyte" for use in the apparatus and method of the invention. Accordingly, "analyte" refers to any chemical moiety which is to be measured quantitatively.

'484 patent, col. 3, ll. 18-31.

We hold that the passage cited by Syntron, taken in context, does not provide reasonable clarity, deliberateness, and precision sufficient to narrow the definition of the claim term in the manner urged. The first portion of the cited passage defines the word "analyte" in terms of the "moiety for which analysis is desired" and "reaction products of the moiety. [**28] " *Id.* at col. 3, ll. 18-22. This portion of the definition comports with the district court's definition of the word as the substance of interest. The last sentence provides a different definition. Because the specification provides two alternative definitions for the term at issue, the specification does not define the claim term in the manner required under *Renishaw*. As correctly construed, therefore, the ordinary meaning of "analyte" as used to instruct the jury is the proper construction, and there is no basis for setting aside the verdict of noninfringement of claims 22 and 23 of the '484 patent on this ground.

E. Doctrine of Equivalents

On August 20, 2002, Abbott filed its reply brief on appeal, arguing for the first time that a new trial should be granted on the issue of infringement under the doctrine of equivalents. Abbott bases this argument on the issuance of

the Supreme Court's decision in *Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co.*, 535 U.S. 722, 152 L. Ed. 2d 944, 122 S. Ct. 1831 (2002), rejecting the complete bar approach to prosecution history estoppel adopted by our earlier decision in *Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co.*, 234 F.3d 558, 56 USPQ2d 1865 (Fed. Cir. 2000) [**29] (en banc). (Appellant's Reply Br. at 17-19.) Abbott argues that it could not have addressed this issue any earlier than May 28, 2002, the date of the Supreme Court's decision. Abbott was on notice that our decision in *Festo* might be reversed by the Supreme Court, and was obligated to present the issue if it wanted to have the benefit of the Supreme Court's decision. ⁶ Abbott has waived the doctrine of equivalents argument by failing to raise it in its opening brief. *Amhil Enters. Ltd. v. Wawa, Inc.*, 81 F.3d 1554, 1563, 38 USPQ2d 1471, 1477 (Fed. Cir. 1996) (stating that a reply brief should "reply to the brief of the appellee" and "is not the appropriate place to raise, for the first time, an issue for appellate review") (internal citation omitted). ⁷

6 Indeed, the district court's order granting judgment as a matter of law addressed the issue of prosecution history estoppel under both our decision in *Festo*, and the preexisting flexible bar approach, recognizing that certiorari had been granted in *Festo*. *Abbott Labs. v. Syntron Bioresearch, Inc.*, 2002 U.S. Dist. LEXIS 25123, No 98-CV-2359 slip op. at 13 (S.D. Cal. Oct. 9, 2001) ("Order Granting JMOL") ("Even if the flexible bar that *Festo* rejected were to control again, prosecution history estoppel would bar Abbott from relying on the doctrine of equivalents for the elements in dispute.").

[**30]

7 Abbott also appears to have raised the issue of prosecution history estoppel for the first time in its reply brief during briefing on JMOL. *Order Denying JMOL* at 32. The district court chastised Abbott for this behavior, but "nonetheless addressed those arguments for the sake of completeness." *Id.*

[*1356] In summary, we affirm the judgment of noninfringement as to claims 1, 22, 29, and 30 of the '162 and as to claim 26 of the '484 patent. However, remand is necessary as to claims 22 and 23 of the '484 patent on the issue of infringement because of the erroneous claim construction.

II.

Synton also cross appeals the judgment that claims 22, 29, and 30 of the '162 patent are not invalid for lack of written description, and that the asserted claims of the '484 patent are not anticipated or rendered obvious by U.S.

Patent No. 4,094,647 to Deutsch et al. ("Deutsch") issued June 13, 1978. ⁸ Even though we have sustained the judgment of noninfringement as to some of these claims, we must nevertheless address the issues of validity raised by the counterclaims in view of the Supreme Court's decision [**31] in *Cardinal Chemical Co. v. Morton International*, 508 U.S. 83, 93-94, 124 L. Ed. 2d 1, 113 S. Ct. 1967 (1993) (requiring a counterclaim of invalidity to be addressed without regard to a determination of noninfringement).

8 No issue is raised on appeal with respect to the enforceability of the patents-in-suit.

At trial the burden was on Synton to prove by clear and convincing evidence that the written description requirement of 35 U.S.C. § 112, P 1, was not met. Compliance with the written description requirement is a question of fact, which is reviewed for substantial evidence. *SunTiger, Inc. v. Scientific Research Funding Group*, 189 F.3d 1327, 1334, 51 USPQ2d 1811, 1815 (Fed. Cir. 1999). The dispute here centers upon whether the disclosure, as originally filed, provided support for the later added claim limitation "diffusively bound." The district court construed this recitation to mean "bound to the solid medium in such a way that the labeled antibody [**32] is capable of detaching from the medium, spreading out, and moving along the test strip." (Tr. at X-131.) Abbott cites the following text from the '162 specification as providing the necessary written description support:

In a preferred embodiment, only a single pass through the apparatus of a single liquid material is required. An analyte may be mixed with an analyte derivative, chromogen or other material and flowed through the apparatus to yield an appropriate test result. In a further preferred embodiment, the apparatus is chemically complete in that it includes all reactants and other chemicals necessary or desirable for the quantitative analysis of an analyte; that is, all that is required is that the analyte in a liquid carrier be flowed through the apparatus. Elements of the apparatus that, if combined, would undergo reaction in the absence of the analyte may be maintained in different zones. For example, the bottom-most layer (20.2) of the strip of FIG. 2 may contain a reactant physically separated from reactants in the adjacent reaction zone. When the analyte in a carrier liquid is flowed through the layer (20.2), the reactant in this layer together with the analyte [**33] and carrier liquid is flowed

into the first reaction zone. *If desired, a reactant may be provided in the form of a solid and may merely be placed upon the upper layer (18.4) of the column of FIG. 1, the reactant being dissolved by and carried with the liquid carrier and analyte into the column.*

'162 patent, col. 12, l. 62 - col. 13, l. 15. Thus, the cited passage teaches placing solid reactant on the upper layer of the test device to be dissolved by the liquid carrier. An expert witness for Abbott testified that in his opinion the claims of both patents were properly fully supported. (Tr. at II-156-57.) That testimony, while [*1357] brief, did provide substantial evidence supporting the jury verdict. *See Union Oil Co. v. Atl. Richfield Co.*, 208 F.3d 989, 999, 54 USPQ2d 1227, 1234 (Fed. Cir. 2000). Moreover, all issued claims are presumed valid. 35 U.S.C. § 282 (2000). The evidentiary burden, therefore, was on Syntron and not Abbott. Syntron failed to prove that, in light of the presumption of validity, no reasonable jury could have decided that Syntron failed to prove by clear and convincing evidence that the claims are invalid for failure [**34] to meet the written description requirement.

Finally, as to the question of the validity of the asserted claims of the '484 patent over Deutsch, that reference was of record during the prosecution of both patents in suit. The presumption of validity remains the same whether or not the art relied upon at trial was before the examiner. *SIBLA Neurosciences, Inc. v. Cadus Pharm. Corp.*, 225 F.3d 1349, 1355-56, 55 USPQ2d 1927, 1931 (Fed. Cir. 2000). However, the fact that a skilled examiner passed upon that very reference during prosecution may be a factor in determining whether the challenger has met the clear and convincing evidence burden. *Id.*; *Alco Standard Corp. v. Tenn. Valley Auth.*, 808 F.2d 1490, 1497, 1 USPQ2d 1337, 1342 (Fed. Cir. 1986).

With respect to anticipation under 35 U.S.C. § 102, the dispute concerns whether Deutsch teaches "flowing said solution along the medium" as required by the asserted claims. As described by Syntron, Deutsch teaches using a "developing fluid" in addition to the sample solution to cause the solution to flow. (Appellee's Br. at 47.) The issue, therefore, is whether the combination of developing [**35] fluid and test sample in Deutsch meets the claim language "flowing said solution along the medium."

The disputed claim language was not separately addressed by the district court, nor did the parties request a

jury instruction concerning this language. The jury instructions stated that the jury "should give any terms not defined by [the court] their ordinary meaning." (Tr. at X-135.) Since Syntron did not urge a particular claim construction of the disputed language before the district court, it has waived the right to do so on appeal. We agree with Abbott that the jury could have reasonably interpreted the language of the claims standing alone as requiring that the solution itself provide the required flow. (Appellant's Reply Br. at 23.) The burden having been on Syntron to prove by clear and convincing evidence that the claims were anticipated, we cannot conclude that the jury verdict on anticipation was not supported by substantial evidence.

Syntron further argues that even if the claims required that the solution itself provide the recited flow, the claims as interpreted would be rendered obvious by Deutsch under 35 U.S.C. § 103. Syntron cites a statement [**36] by an expert for Abbott that the use of the fluid sample to drive the flow was known in the prior art. (Appellee's Br. at 51.) Knowledge in the prior art of every element of a patent claim, however, is not of itself sufficient to render claim obvious. *Graham v. John Deere Co.*, 383 U.S. 1, 17-18, 15 L. Ed. 2d 545, 86 S. Ct. 684 (1966); *Teleflex*, 299 F.3d at 1333-34, 63 USPQ2d at 1386. The issue is whether substantial evidence supports the judgment (under the clear and convincing evidence standard) that a person having ordinary skill in the art would not have been motivated to replace the developing fluid/sample solution combination of Deutsch with flow provided solely by sample fluid. Upon review of the evidence presented on the issue of obviousness in view of Deutsch, and in view of the burden of proof, we sustain the judgment of non-obviousness.

[*1358] CONCLUSION

Thus, we affirm the judgment of noninfringement as to claim 26 of the '484 patent and claims 1, 22, 29, and 30 of the '162 patent. We also affirm the judgment on validity of all the asserted claims. Finally, we reverse the judgment of noninfringement as to claims 22 and 23, and remand for further [**37] proceedings consistent with this opinion.

AFFIRMED IN PART AND REVERSED AND REMANDED IN PART.

COSTS

No costs.

5 of 230 DOCUMENTS

AKAMAI TECHNOLOGIES, INC. and MASSACHUSETTS INSTITUTE OF TECHNOLOGY, Plaintiffs-Appellees, v. CABLE & WIRELESS INTERNET SERVICES, INC., Defendant-Appellant, and KINETECH, INC., Defendant.

03-1007

UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

344 F.3d 1186; 2003 U.S. App. LEXIS 19065; 68 U.S.P.Q.2D (BNA) 1186

September 15, 2003, Decided

SUBSEQUENT HISTORY: Rehearing denied by, Rehearing, en banc, denied by *Akamai Techs., Inc. v. Cable & Wireless Internet Servs.*, 2003 U.S. App. LEXIS 25555 (Fed. Cir., Nov. 13, 2003)

PRIOR HISTORY: [*1] Appealed from: United States District Court for the District of Massachusetts. Judge Rya W. Zobel. *Akamai Techs., Inc. v. Cable & Wireless Internet Servs.*, 2002 U.S. Dist. LEXIS 15543 (D. Mass., Aug. 21, 2002)

DISPOSITION: AFFIRMED-IN-PART, REVERSED-IN-PART AND REMANDED.

COUNSEL: Mark T. Banner, Banner & Witcoff, Ltd., of Chicago, Illinois, argued for plaintiffs-appellees. With him on the brief were Pamela B. Krupka, of Washington, DC; and Aimee M. Boss, of Chicago, Illinois.

Arthur B. Wineburg, Pillsbury Winthrop LLP, of McLean, Virginia, argued for defendant-appellant. With him on the brief were Susan T. Brown, Daniel E. Yonan, of McLean, Virginia, and Brian J. Beatus, of Palo Alto, California. Of counsel were Brian Sirtizky, Pillsbury Winthrop, LLP, of McLean, Virginia; and Eileen M. Herlihy and John T. Bennett, Palmer & Dodge LLP, of Boston, Massachusetts.

JUDGES: Before NEWMAN, GAJARSA, and DYK, Circuit Judges. Opinion for the court filed by Circuit Judge GAJARSA. Concurring-in-part and dissenting-in-part opinion filed by Circuit Judge NEWMAN.

OPINION BY: GAJARSA

OPINION

[*1188] GAJARSA, *Circuit Judge*.

Defendant-Appellant, Cable & Wireless Internet Services, Inc. ("C&W"), appeals the orders of the United States District Court for the District of Massachusetts: (1) denying C&W's motion for judgment as a matter [**2] of law challenging the jury verdict that claims 1, 3, 5, and 9 of *U.S. Patent No. 6,108,703* ("the '703 patent'") are valid and infringed; and (2) granting a permanent injunction based upon the jury verdict. *Akamai Techs., Inc. v. Cable & Wireless Internet Servs.*, 2002 U.S. Dist. LEXIS 15543, No. 00-CV-11851 (D. Mass. May 24 and Aug. 21, 2002). Because claims 1 and 3, properly construed, are anticipated by *U.S. Patent No. 6,185,598* ("the '598 patent'") and are therefore invalid under 35 U.S.C. § 102, we reverse the district court's denial of C&W's motion for judgment as a matter of law with respect to claims 1 and 3 and vacate that portion of the permanent injunction. We affirm the district court's denial of C&W's motion for judgment as a matter of law with respect to the validity of claims 5 and 9 because those claims, properly construed, are not invalid. We also affirm the district court's denial of C&W's motion for judgment as a matter of law with respect to infringement of claim 9 because substantial evidence supports the jury's verdict of infringement. In view of our holding, we remand to the district court to review the scope of the permanent injunction.

I. BACKGROUND

The present [**3] appeal concerns technology for alleviating Internet congestion. To better understand the present dispute, a general overview of the relevant technology follows. Generally, people share information, i.e., "content," over the Internet through web pages. To look at web pages, a computer user accesses the Internet through a browser, e.g., Microsoft Internet Explorer (R) or Netscape Navigator (R). These browsers display web pages stored on a network of servers commonly referred to as the Internet. To access the web pages, a computer user

enters into the browser a web page address, or uniform resource locator ("URL"). The URL is typically a string of characters, e.g., www.fedcir.gov. This URL has a corresponding unique numerical address, e.g., 156.119.80.10, called an Internet Protocol ("IP") address. When a user enters a URL into the browser, a domain name service ("DNS") searches for the corresponding IP address to properly locate the web page to be displayed. The DNS is administered by a separate network of computers distributed throughout, and connected to, the Internet. These computers are commonly referred to as DNS servers. In short, a DNS server translates the URL into the proper [**4] IP address, thereby informing the user's computer where the host server for the web page www.fedcir.gov is located, a process commonly referred to as "resolving." The [**1189] user's computer then sends the web page request to the host server, or origin server. An origin server is a computer associated with the IP address that receives all web page requests and is responsible for responding to such requests. In the early stages of the Internet, the origin server was also the server that stored the actual web page in its entirety. Thus, in response to a request from a user, the origin server would provide the web page to the user's browser. Internet congestion problems quickly surfaced in this system when numerous requests for the same web page were received by the origin server at the same time.

This problem is exacerbated by the nature of web pages. A typical web page has a Hypertext Markup Language ("HTML") base document, or "container" document, with "embedded objects," such as graphics files, sound files, and text files. Embedded objects are separate digital computer files stored on servers that appear as part of the web page. These embedded objects must be requested from the origin server [**5] individually. Thus, each embedded object often has its own URL. To receive the entire web page, including the container document and the embedded objects, the user's web browser must request the web page and each embedded object. Thus, for example, if a particular web page has nine embedded objects, a web browser must make ten requests to receive the entire web page: one for the container document and nine for the embedded objects.

There have been numerous attempts to alleviate Internet congestion, including methods commonly referred to as "caching," "mirroring," and "redirection." "Caching" is a solution that stores web pages at various computers other than the origin server. When a request is made from a web browser, the cache computers intercept the request, facilitate retrieval of the web page from the origin server, and simultaneously save a copy of the web page on the cache computer. The next time a similar request is made, the cache computer, as opposed to the origin computer, can provide the web page to the user.

"Mirroring" is another solution, similar to caching, except that the origin owner, or a third party, provides additional servers throughout the Internet that contain [**6] an exact copy of the entire web page located on the origin server. This allows a company, for example, to place servers in Europe to handle European Internet traffic.

"Redirection" is yet another solution in which the origin server, upon a request from a user, redirects the request to another server to handle the request. Redirection also often utilizes a process called "load balancing," or "server selection." Load balancing is often effected through a software package designed to locate the optimum origin servers and alternate servers for the quickest and most efficient delivery and display of the various container documents and embedded objects. Load balancing software locates the optimum server location based on criteria such as distance from the requesting location and congestion or traffic through the various servers.

Load balancing software was also known prior to the '703 patent. For example, Cisco Systems, Inc. marketed and sold a product by the name of "Distributed Director," which included server selection software that located the optimum server to provide requested information. The server selection software could be placed at either the DNS servers or the content [**7] provider servers. The Distributed Director product was disclosed in a White Paper dated February 21, 1997 and in U.S. Patent No. 6,178,160 ("the '160 patent"). [**1190] Both the White Paper and the '160 patent are prior art to the '703 patent. The Distributed Director product, however, utilized this software in conjunction with a mirroring system in which a particular provider's complete web page was simultaneously stored on a number of servers located in different locations throughout the Internet. Mirroring had many drawbacks, including the need to synchronize continuously the web page on the various servers throughout the network. This added extra expenses and contributed to congestion on the Internet.

Massachusetts Institute of Technology is the assignee of the '703 patent directed to a "global hosting system" and methods for decreasing congestion and delay in accessing web pages on the Internet. Akamai Technologies, Inc. is the exclusive licensee of the '703 patent.¹ The '703 patent was filed on May 19, 1999, and issued on August 22, 2000. The '703 patent discloses and claims web page content delivery systems and methods utilizing separate sets of servers to provide various aspects [**8] of a single web page: a set of content provider servers (origin servers), and a set of alternate servers. The origin servers provide the container document, i.e., the standard aspects of a given web page that do not change frequently. The alternate servers provide the often changing embedded objects. The '703 patent also discloses use of a load bal-

ancing software package to locate the optimum origin servers and alternate servers for the quickest and most efficient delivery and display of the various container documents and embedded objects.

1 For purposes of this opinion both plaintiffs are collectively referred to as "Akamai."

Independent claim 1, which is representative, reads:

1. A distributed hosting framework operative in a computer network in which users of client machines connect to a content provider server, the framework comprising:

a routine for modifying at least one embedded object URL of a web page to include a hostname pretended to a domain name and path;

a set of content servers, distinct [***] from the content provider server, for hosting at least some of the embedded objects of web pages that are normally hosted by the content provider server;

at least one first level name server that provides a first level domain name service (DNS) resolution; and

at least one second level name server that provides a second level domain name service (DNS) resolution;

wherein in response to requests for the web page, generated by the client machines the web page including the modified embedded object URL is served from the content provider server and the embedded object identified by the modified embedded object URL is served from a given one of the content servers as identified by the first level and second level name servers.

'703 patent, col. 17, ll. 17-37 (emphases added).

C&W is the owner, by assignment, of the '598 patent. The '598 patent is directed to similar systems and methods for increasing the accessibility of web pages on the Internet. The '598 patent was filed on February 10, 1998, and issued on February 6, 2001. Thus the '598 patent is prior art to the '703 patent pursuant to 35 U.S.C. § 102(e).

² C&W marketed and [***1191] sold products [***10] embodying the '598 patent under the name "Footprint." The relevant difference between the disclosure of the '598 patent and Akamai's preferred embodiment disclosed in

the '703 patent is the location of the load balancing software. Akamai's preferred embodiment has the load balancing software installed at the DNS servers, while the '598 patent discloses installation of the load balancing software at the content provider, or origin, servers. The '598 patent does not disclose or fairly suggest that the load balancing software can be placed at the DNS servers. It is now understood that placement of the software at the DNS servers allows for load balancing during the resolving process, resulting in a more efficient system for accessing the proper information from the two server networks. Indeed, C&W later created a new product, "Footprint 2.0," the systems subject to the permanent injunction, in which the load balancing software was installed at the DNS servers as opposed to the content provider servers. Footprint 2.0 replaced C&W's Footprint product.

2 Akamai does not dispute that the '598 patent is "prior art" to the '703 patent for purposes of validity under 35 U.S.C. § 102 or § 103.

[**11] On September 13, 2000, Akamai sued C&W seeking an injunction and damages for infringement of the '703 patent. Among other things, Akamai asserted that C&W's Footprint 2.0 content delivery network infringed apparatus claims 1, 3, 5, and 9 and method claims 17, 18, and 22 of the '703 patent.

C&W answered the Complaint alleging that Footprint 2.0 did not infringe the claims of the '703 patent and that the claims of the '703 patent were invalid under 35 U.S.C. §§ 102 and 103(a). In particular, C&W asserted that the '598 patent anticipated the asserted claims and that the asserted claims were obvious in light of the '598 patent in combination with Cisco's Distributed Director product.

The district court conducted a *Markman* hearing and entered its order construing the disputed terms of the '703 patent (as well as two other patents that are not at issue in this appeal). The district court stated that "at the time of the *Markman* hearing, the parties . . . did not appear to have a common understanding as to which additional claims were still in dispute. The parties' written and oral presentations offer little assistance in this regard. I therefore limit my [***12] ruling to the terms above." Notably, the parties did not appear to dispute the construction of any terms in the "wherein" clause of claim 1.

After a 19-day jury trial, the jury determined that C&W infringed apparatus claims 1, 3, 5, and 9 and method claims 17, 18, and 22. The jury upheld the validity of apparatus claims 1, 3, 5, and 9. The jury invalidated claims 17, 18, and 22 under 35 U.S.C. §§ 102 and 103(a) as either anticipated by the '598 patent or obvious in light of the '598 patent in view of Cisco's Distributed Director product. C&W filed its motion for judgment as a matter of

law in February 2002 asserting that claims 1, 3, 5, and 9 were invalid and/or not infringed. The district court denied that motion and permanently enjoined C&W from "making, using, selling, offering for sale, or importing into the United States the patented inventions claimed in claims 1, 3, 5, and 9 of the '703 patent," in an Order that "extended to Footprint 2.0 service, as configured and described at trial."

C&W appealed the denial of its motion for judgment as a matter of law and the district court's entry of a permanent injunction on the bases that claim 9 was not infringed [*13] and that claims 1, 3, 5 and 9 were invalid for anticipation and/or obviousness. C&W did not appeal the infringement of claims 1, 3, and 5. We have jurisdiction [*1192] over this appeal pursuant to 28 U.S.C. §§ 1292(a), (c)(1), and 1295(a)(1).

II. DISCUSSION

We review the denial of a motion for judgment as a matter of law following a jury verdict by reapplying the district court's standard of review. *Catalina Lighting, Inc. v. Lamps Plus, Inc.*, 295 F.3d 1277, 1284 (Fed. Cir. 2000); *Stryker Corp. v. Davol, Inc.*, 234 F.3d 1252, 1257 (Fed. Cir. 2000); *Tec Air, Inc. v. Denso Mfg.*, 192 F.3d 1353, 1357 (Fed. Cir. 1999). Thus, we review claim construction, an issue of law, *de novo*. *Sibia Neurosciences, Inc. v. Cadus Pharm. Corp.*, 225 F.3d 1349, 1354 (Fed. Cir. 2000).

With regard to factual findings, we must presume that the jury resolved all factual disputes in favor of the prevailing party, and we must leave those findings undisturbed as long as they are supported by substantial evidence. *Id.* A factual finding is supported by substantial evidence if a reasonable jury could have found in favor of [*14] the prevailing party in light of the evidence presented at trial. *Tec Air*, 192 F.3d at 1358. "Substantial evidence is more than a mere scintilla. It means such relevant evidence as a reasonable mind might accept as adequate to support a conclusion." *Consol. Edison Co. v. NLRB*, 305 U.S. 197, 229, 83 L. Ed. 126, 59 S. Ct. 206 (1938). Thus, substantial evidence review involves an examination of the record as a whole, taking into consideration evidence that both justifies and detracts from the decision of the fact-finder. *In re Gartside*, 203 F.3d 1305, 1312 (Fed. Cir. 2000); *Nat'l Presto Indus., Inc. v. W. Bend Co.*, 76 F.3d 1185, 1192 (Fed. Cir. 1996) (holding that a jury verdict must be sustained if it is supported by substantial evidence based on a review of the entirety of the record). In reviewing the record, we must draw all reasonable inferences in favor of the prevailing party, and not make credibility determinations or substitute our view of the conflicting evidence for that of the jury. *Sibia*, 225 F.3d at 1355 (citing *Cornell v. Sears, Roebuck & Co.*, 722 F.2d 1542, 1546 (Fed. Cir. 1983)). [*15] If, however,

after reviewing all of the evidence in a light most favorable to the prevailing party, this court is convinced that a reasonable jury could not have found in that party's favor, we must reverse the denial of a motion for judgment as a matter of law. *Id.*

A. Anticipation

C&W appeals the jury finding that claims 1 and 3 were valid as not anticipated by the disclosure of the '598 patent. The first step in any invalidity analysis is claim construction, an issue of law this court reviews *de novo*. *Cybor Corp. v. FAS Techs., Inc.*, 138 F.3d 1448, 1456 (Fed. Cir. 1998) (*en banc*). The second step, determining whether a prior art reference discloses each and every limitation of the claim expressly or inherently, *Scripps Clinic & Research Found. v. Genentech, Inc.*, 927 F.2d 1565, 1576-77 (Fed. Cir. 1991), is a factual question reviewed for substantial evidence. *Eaton Corp. v. Rockwell Int'l Corp.*, 323 F.3d 1332, 1343 (Fed. Cir. 2003). This factual question is contingent upon the proper claim construction. *Id.* at 1344. A claim limitation is inherent in the prior art if it is necessarily present [*16] in the prior art, not merely probably or possibly present. *Rosco v. Mirror Lite*, 304 F.3d 1373, 1380 (Fed. Cir. 2002). "The dispositive question regarding anticipation is whether one skilled in the art would reasonably understand or infer from the prior art reference's teaching that every claim [limitation] was disclosed in that single reference." *Dayco Prods., Inc. v. Total Containment, Inc.*, 329 F.3d 1358, 1368 [*1193] (Fed. Cir. 2003) (internal quotation marks and alterations omitted).

Through trial and on appeal, the parties have narrowed the disputed issues of validity to a single point of contention—the placement of the load balancing software at either the DNS servers or the origin server. Therefore, our initial focus in the anticipation analysis is on the construction of claims 1 and 3, in particular whether claims 1 and 3 require the presence of load balancing software at the DNS servers. The issue before us is thus a relatively self-contained one. On the one hand, if claims 1 and 3 require load balancing at the DNS servers, the claims are not anticipated. On the other hand, if the claims do not require this limitation, they are anticipated by [*17] the '598 patent. The only disputed limitation of claims 1 and 3 reads:

wherein in response to requests for the web page, generated by the client machines the web page including the modified embedded object URL is served from the content provider server and the embedded object identified by the modified embedded object URL is served from a given one of the content servers as identi-

fied by the first level and second level name servers.

'703 patent, col. 17, ll. 31-37 (emphases added).

Claim 3 is dependent upon independent claim 1 and includes the following additional limitation.

3. The hosting framework as described in claim 1 further including a redundant second level name server.

Id., col. 17, ll. 40-41.

Akamai contends that the '*598 patent* differs from claims 1 and 3 of the '*703 patent* in the placement of the load balancing software. Indeed, in its brief on appeal, Akamai stated:

The significant *difference* between the prior art '*598 patent* and the '*703 patent* claims on appeal was *acknowledged and admitted* by everyone throughout the trial. . . . In particular, C&W counsel told the jury the difference involves the fact that [*18] selection of the best computer server to deliver the embedded objects of the web page is done in the '*598 prior art patent* by "software . . . located at the origin server" whereas selection of the best computer server to deliver the content is done in the '*703 patent* "by software located at the DNS"

C&W argues that the location of the load balancing software is not a limitation in claims 1 and 3, and in the alternative, that while the '*598 patent* does not explicitly disclose the placement of load balancing software at the DNS servers, it is nevertheless inherent in the Internet and the '*598 patent*.

We agree that claims 1 and 3 do not include a load balancing limitation. While the written description unquestionably contemplates the preferred location of the load balancing software, claims 1 and 3 do not *expressly* require its presence. To support its reading of independent claim 1, Akamai points only to the term "identifying" in the "wherein" clause of claim 1 which states:

wherein in response to requests for the web page, generated by the client machines the web page including the modified embedded object URL is served from the content provider server and [*19] the

embedded object identified by the modified embedded object URL is served from a given one of the content servers as *identified by the first level and second level name servers.*

This language, however, requires only that the embedded object is "identified by the modified embedded object URL" and is "served from a given one of the content [*1194] servers as identified by the first and second level name servers." The plain meaning of the claim language does not require any load balancing mechanism. Instead, it simply requires the embedded object to be served from "the content servers as identified by the first level and second level name servers." Load balancing, *if required at all*, could be at either the DNS servers or the content provider server. The ordinary meaning of the term "identifying" in claims 1 and 3 covers standard DNS resolution, without any sort of load balancing. Absent evidence that a "patentee unequivocally imparted a novel meaning to [the] term[] or expressly relinquished claim scope during prosecution," we give the limitation its full ordinary and customary meaning. *Omega Eng'g, Inc. v. Raytek Corp.*, 334 F.3d 1314, 1323 (Fed. Cir. 2003); [*20] *Teleflex, Inc. v. Ficoso N. Am. Corp.*, 299 F.3d 1313, 1325-26 (Fed. Cir. 2002); *CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1366-67 (Fed. Cir. 2002); *Renishaw PLC v. Marposh Societa' Per Azioni*, 158 F.3d 1243, 1249 (Fed. Cir. 1998) ("Absent a special and particular definition created by the patent applicant, terms in a claim are to be given their ordinary and accustomed meaning.").

The only question that remains is whether the written description or the prosecution history unequivocally shows that the inventors imparted a novel meaning to the term "identifying" to include load balancing. *Omega Eng'g*, 334 F.3d at 1323; *Teleflex*, 299 F.3d at 1325-26. The written description does not specifically define the term "identifying." Rather, the discussion with respect to load balancing focuses on the DNS servers as performing "special functions," e.g., load balancing functions, without any reference to the term "identifying." *See, e.g.*, '*703 patent*, col. 9, ll. 31-48. Similarly, the parties have pointed to nothing in the prosecution history with respect to the term "identifying." Akamai's only [*21] evidence that supports its special definition of the term "identifying" is the testimony of one of the inventors, Mr. Farber, of the '*598 patent*. Mr. Farber stated that: "the DNS in our system are a little different because we did the step of identifying . . . which repeater should be used by the browser as part of the, using [sic] the HTTP method instead of the DNS method." ³ This extrinsic evidence is not the unequivocal evidence, *Omega Eng'g*, 334 F.3d at 1323, indicating the term "identifying" should take anything other than its ordinary and accustomed meaning. While

this possibly suggests that the inventors believed the "identifying" step included a load balancing function, "what the patentee subjectively intended his claims to mean is largely irrelevant to the claim's objective meaning and scope." *Solomon v. Kimberly-Clark Corp.*, 216 F.3d 1372, 1379 (Fed. Cir. 2000). It is also not testimony that clearly supports the proposition that the term "identifying" has a special meaning to one of ordinary skill in the art.

3 The "HTTP method" refers to placement of the load balancing software at the origin servers responsible for providing the HTTP container page.

[**22] Thus claim 1, as properly construed, does not include the limitation of the placement of the load balancing mechanism. The parties agree that the '598 patent discloses all the remaining limitations of claim 1. Because claim 1 does not require exact placement, it is therefore invalid as anticipated by the '598 patent.

Claim 3 similarly does not require placement of the load balancing software at the DNS servers. Claim 3 only includes the additional limitation that the hosting framework as described in claim 1 further includes "a redundant second level name [*1195] server." On appeal, Akamai's primary argument echoes that of claim 1, namely that the load balancing software is located at the DNS servers. Akamai's only separate argument with respect to claim 3 is that "because [the] '598 patent did not even mention hierarchical DNS (i.e., more than one level), clearly the jury was entitled to reject the notion that [the] '598 [patent] also anticipated claim 3." This additional argument, however, fails to address C&W's contention that hierarchical DNS is inherent in any Internet system. Indeed, C&W proffered documentary evidence and testimony at trial that redundant domain name servers [**23] are inherent in any Internet-based application. See *Dayco*, 329 F.3d at 1369. Akamai points to no evidence whatsoever that contradicts the evidence presented to the jury at trial. Accordingly, we hold that any inference in favor of Akamai relating to the redundant second level server in claim 3 is unsupported by substantial evidence. The addition of a redundant second level DNS server does not save the validity of dependent claim 3. Claim 3 is therefore also invalid under 35 U.S.C. § 102 as anticipated by the '598 patent.'

4 Judge Newman in her dissent specifically points out that the issue of anticipation is a question of fact. Claim construction, however, is a question of law. Before the factual question of anticipation may be addressed, a court must first properly construe the claims before it. Here, claims 1 and 3 were not properly construed by the district court. Therefore, a necessary first step in

this court's anticipation inquiry was to properly construe the claims at issue.

[**24] B. Obviousness

C&W next claims that it is entitled to judgment as a matter of law that claims 5 and 9 are obvious in light of the '598 patent in combination with Cisco's Distributed Director product and are therefore invalid. Claims 5 and 9, which are dependent on independent claim 1, include the following additional limitations.

5. The hosting framework as described in claim 1 wherein the second level name server includes a load balancing mechanism that balances loads across a subset of the set of servers.

9. The hosting framework as described in claim 1 wherein the first level name server includes a network map for use in directing a request for the embedded object generated by a client.

5 C&W also challenges the validity of claims 1 and 3 under the same obviousness theory. Because we hold that claims 1 and 3 are anticipated by the '598 patent, we need not reach this argument.

We review the ultimate determination of obviousness *de novo*. *Modine Mfg. Co. v. Allen Group, Inc.*, 917 F.2d 538, 541 (Fed. Cir. 1990). [**25] This ultimate determination, however, requires underlying factual findings, which this court reviews to determine whether they are supported by substantial evidence and, if they are, whether those findings support the legal conclusions which necessarily were drawn by the jury in forming its verdict. *Id.* A claimed invention is unpatentable due to obviousness if the differences between it and the prior art "are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art." 35 U.S.C. § 103(a) (2000). While the ultimate conclusion of obviousness is for the court to decide as a matter of law, several factual inquiries underlie this determination. *Graham v. John Deere Co.*, 383 U.S. 1, 17-18, 15 L. Ed. 2d 545, 86 S. Ct. 684 (1966). These inquiries include the scope and content of the prior art, the level of ordinary skill in the field of the [*1196] invention, the differences between the claimed invention and the prior art, and any objective evidence of nonobviousness such as long-felt need and commercial success. *Id.* When a rejection depends on a combination of prior [**26] art references, there must be some teaching, suggestion, or motivation to combine the references. *In re*

Geiger, 815 F.2d 686, 688 (Fed. Cir. 1987). Although the suggestion to combine references may flow from the nature of the problem, *Pro-Mold & Tool Co. v. Great Lakes Plastics, Inc.*, 75 F.3d 1568, 1573 (Fed. Cir. 1996), the suggestion more often comes from the teachings of the pertinent references, *In re Sernaker*, 702 F.2d 989, 994 (Fed. Cir. 1983), or from the ordinary knowledge of those skilled in the art that certain references are of special importance in a particular field, *Pro-Mold*, 75 F.3d at 1573 (citing *Ashland Oil, Inc. v. Delta Resins & Refractories, Inc.*, 776 F.2d 281, 297 n.24 (Fed. Cir. 1985)). Therefore, "when determining the patentability of a claimed invention which combines two known elements, 'the question is whether there is something in the prior art as a whole to suggest the desirability, and thus the obviousness, of making the combination.'" *In re Beattie*, 974 F.2d 1309, 1311-12 (Fed. Cir. 1992) (quoting *Lindemann Maschinenfabrik GmbH v. Am. Hoist & Derrick Co.*, 730 F.2d 1452, 1462 (Fed. Cir. 1984)). [*27]

To prevail, C&W must therefore show that no reasonable jury could have found claims 5 and 9 nonobvious in light of the evidence presented. *Tec Air*, 192 F.3d at 1358. Here, C&W has not met this burden. Namely, we are unable to discern any suggestion or motivation to combine the references as C&W suggests in the record before us. Indeed, when pressed on this issue at oral argument, C&W could point only to Cisco's Distributed Director product, which at best disclosed that load balancing software could be placed at either the DNS servers or the origin servers for a "mirroring" system. In its brief, C&W pointed to the fact that the '598 patent, the '703 patent, and Cisco's Distributed Director product all address the same problem: Internet congestion.

Our review of the evidence presented to the jury does not persuade us that no reasonable jury could have found claims 5 and 9 nonobvious over the prior art, and we decline to disturb the factual findings of the jury. Drawing all factual inferences in favor of Akamai, we affirm the jury's verdict with respect to the validity of claims 5 and 9 because there was no suggestion or motivation to combine the references.

Additionally, [*28] the record contains substantial evidence relating to secondary considerations supporting the jury's verdict. In particular, the record shows that C&W expended significant effort to determine how Akamai's products worked. Once it was determined that Akamai placed the server selection software at the DNS servers, C&W redesigned its Footprint product, abandoning the embodiments in the '598 patent. The new Footprint 2.0 design incorporated Akamai's placement of the load balancing mechanism at the DNS server. This evidence of copying is relevant to an obviousness determination. See *Advanced Display Sys., Inc. v. Kent State Univ.*, 212 F.3d 1272, 1285 (Fed. Cir. 2000); *Vandenberg*

v. Dairy Equip. Co., 740 F.2d 1560, 1567 (Fed. Cir. 1984) ("The copying of an invention may constitute evidence that the invention was not an obvious one. . . . This would be particularly true where the copyst had itself attempted for a substantial length of time to design a similar device, and had failed."). C&W's redesign process was documented in the record in internal emails from C&W engineers discussing [*1197] Akamai's approach, identifying weaknesses in C&W's approach, and ultimately [*29] deciding to switch to the Akamai system.

In sum, C&W has not shown that the jury's conclusion that claims 5 and 9 of the '703 patent are nonobvious under 35 U.S.C. § 103(a) is unsupported by substantial evidence. Accordingly, we hold that claims 5 and 9 of the '703 patent are not obvious in light of the '598 patent in view of Cisco's Distributed Director product, and therefore affirm the district court's ruling denying C&W's motion for judgment as a matter of law and affirm the grant of a permanent injunction against C&W with respect to claims 5 and 9.

C. Infringement of Claim 9

Having addressed validity of the various claims of the '703 patent, we next turn to the jury's finding of infringement with respect to dependent claim 9. We review the record as a whole to determine whether substantial evidence exists to support the jury's finding that claim 9 is infringed. C&W objects to the jury verdict based on the fact that Dr. Bustavros's expert report was limited to infringement under the doctrine of equivalents. Akamai counters with cites to the testimony of Dr. Bustavros, who testified that C&W's Footprint 2.0 system included a network map routine and [*30] therefore infringed claim 9, without any reference to a limitation under the doctrine of equivalents. This dispute appears to be one of interpretation and weight of a witness's testimony—one for the jury to resolve. This court generally does not tread on the jury's role in making these determinations. Thus, we affirm the jury's finding of infringement of claim 9 as supported by substantial evidence, namely Dr. Bustavros's testimony at trial.

III. CONCLUSION

For the foregoing reasons, we hold that claims 1 and 3 of the '703 patent are anticipated by the '598 patent and are invalid pursuant to 35 U.S.C. § 102. We therefore reverse the district court's denial of C&W's motion for judgment as a matter of law with respect to the validity of claims 1 and 3, and instruct the district court to modify the permanent injunction accordingly. We also affirm the district court's denial of C&W's motion for judgment as a matter of law with respect to claims 5 and 9 and therefore affirm the district court's issuance of the permanent injunction with respect to those claims. We remand to the

district court to review and redetermine the scope of the permanent injunction.

AFFIRMED-IN-PART. [**31]
REVERSED-IN-PART AND REMANDED.

IV. COSTS

No costs.

CONCUR BY: NEWMAN (In Part)

DISSENT BY: NEWMAN (In Part)

DISSENT

NEWMAN, *Circuit Judge*, concurring in part, dissenting in part.

I concur in much of the court's decision. However, the court provides no sufficient basis for overturning the findings of the jury and overturning the affirmance by the district court with respect to the question of anticipation of claims 1 and 3.

The issue of anticipation is a question of fact, and the jury verdict that there is not anticipation must be sustained if there is substantial evidence in its support. It is not disputed that the prior art (the defendant's '598 patent) does not disclose and does not embody the DNS lookup of the Akamai '703 patent. There was extensive evidence, presented by both sides, as to the content of the prior art; there was substantial evidence that the prior art's origin server "reflector" is a different structure and method, and that the subject [*1198] matter of claims 1 and 3 does not read on the prior art. If there were any question concerning claims 1 and 3, the question would be one of obviousness, not anticipation. The jury verdict that these claims were not anticipated was supported [**32] by substantial evidence, with a lengthy and thorough and fully presented trial, and a verdict that could have been reached by a reasonable jury. The criteria of reversal are not met.

Akamai correctly points out that the defendant makes no effort to discuss the support, or lack thereof, for the jury verdict. My colleagues on this panel commit the same error, for the majority opinion says not a word about the evidence at trial, but simply decides the question for itself. Reversal of the judgment rendered on a jury verdict is appropriate only if there is no legally sufficient evidentiary basis for the verdict. See *Fed. R. Civ. P. 50(a)(1)*; *Intercity Maint. Co. v. Local 254, SEIU Service Employees International Union*, 241 F.3d 82, 86 (1st Cir. 2001);

National Presto Industries, Inc. v. West Bend Co., 76 F.3d 1185, 1192 (*Fed. Cir.* 1996).

The sufficiency of the evidence must be reviewed in the light most favorable to the party that received the verdict, with all reasonable inferences drawn in favor of the verdict. *Shells Title Co. v. Commonwealth Land Title Insurance Co.*, 184 F.3d 10, 19 (1st Cir. 1999); *Sibia Neurosciences, Inc. v. Cadus Pharmaceutical Corp.*, 225 F.3d 1349, 1355 (*Fed. Cir.* 2000). [**33] It was not disputed, indeed it was admitted by C&W, that the prior art did not show either the claim 1 limitation that the content server is "distinct from the content provider server" (clause 3 of claim 1) or that "the embedded object identified by the modified embedded object URL is served from a given one of the content servers as identified by the first level and second level name servers" (sixth clause of claim 1). Even C&W's technical expert Dr. Dewar conceded that "the one thing that is not taught explicitly by the '598 patent is the use of DNS." Claim 1's clauses 4 and 5 require "first level" and "second level" "domain name service (DNS) resolution." Although Dr. Dewar went on to express the opinion that these changes would have been obvious, he did not testify that they were present, even inherently, in the '598 reference. The prior art was not shown to suggest or use or contemplate the DNS as used by the MIT inventors.

Claim 1 requires identification of the content server of the distributed hosting framework during the DNS lookup. Witnesses for both sides agreed that this differs from ordinary use in the context of the internet, and that persons experienced in this field [**34] would readily so understand. It is seriously incorrect for this court to reconstruct the invention and then to invalidate the claims on its own findings, ignoring the evidence at the trial.¹

1 The claims were construed by agreement before trial, and the only issues relate to validity and infringement. It is inappropriate to recharacterize the factual question of anticipation as one of claim construction, instead of deciding the appeal on the basis on which it was tried, and on the appropriate standard for review of jury verdicts.

There was substantial evidence by which the jury could have found that all of the limitations of claims 1 and 3 are not present in the prior art. The acknowledged differences from the prior art render untenable the panel majority's restatement of the issues, as well as their resolution of the factual question of anticipation in order to invalidate the claims.

I respectfully dissent.

LEXSEE 190 F.3D 1342

**ATLAS POWDER COMPANY, Plaintiff, and HANEX PRODUCTS, INC.,
Plaintiff-Appellant, v. IRECO INCORPORATED and ICI EXPLOSIVES USA,
INC., Defendants-Appellees.**

99-1041

UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

190 F.3d 1342; 1999 U.S. App. LEXIS 21394; 51 U.S.P.Q.2D (BNA) 1943

September 7, 1999, Decided

PRIOR HISTORY: [**1] Appealed from: United States District Court for the District of Wyoming. Chief Judge Alan B. Johnson.

DISPOSITION: AFFIRMED.

COUNSEL: Stanford B. Owen, Fabian & Clendenin, of Salt Lake City, Utah, argued for plaintiff-appellant, Hanex Products, Inc. With him on the brief were W. Cullen Battle, Robert A. Garda, Jr., and Jon C. Martinson.

Gordon L. Roberts, Parsons Behle & Latimer, of Salt Lake City, Utah, argued for defendant-appellee, IRECO Incorporated and ICI Explosives USA, Inc. Of counsel on the brief was C. Kevin Speirs.

JUDGES: Before MAYER, Chief Judge, MICHEL and RADER, Circuit Judges.

OPINION BY: RADER

OPINION

[*1343] RADER, *Circuit Judge*.

The United States District Court for the District of Wyoming determined that U.S. Patent No. 4,111,727 (the Clay patent) and its reissue, U.S. Patent No. RE 33,788 (the reissue patent) were invalid. Atlas Powder Company (Atlas), a licensee under those patents, sued IRECO Incorporated (IRECO) for infringement of the Clay patent. Following two bench trials, the district court concluded that both the original Clay patent and the

reissue patent were invalid as anticipated by either U.S. Patent No. 3,161,551 (Egly) or U.K. *Patent No. 1,306,546* (Butterworth). Because [**2] the district court correctly interpreted the claims and applied the law of anticipation, this court affirms the finding of invalidity.

I.

The Clay patent and its reissue both claim explosive compositions. To detonate, [*1344] explosives require both fuel and oxidizers. The oxidizer rapidly reacts with the fuel to produce expanding gases and heat - an explosion. Composite explosives mix various sources of fuel and oxygen. The most widely used and economical composite explosive is ammonium nitrate and fuel oil (ANFO). ANFO explosives mix about 94% by weight of ammonium nitrate (AN), the oxidizer, with 6% by weight of fuel oil (FO). The AN may include porous prills, dense prills, Stengel flakes, or crystalline AN. ANFO explosives have two primary disadvantages. First, wet conditions dissolve the AN and make the explosive unusable in damp settings. Second, ANFO is a relatively weak explosive because interstitial air occupies considerable space in the mixture, thereby decreasing the amount of explosive material per unit of volume.

To address these shortcomings, explosive experts developed water-in-oil emulsions. These emulsions dissolved the oxidizer into water and then dispersed the solution [**3] in oil. Because oil surrounds the oxidizer, it is resistant to moisture, thus solving one of the problems with ANFO. Emulsions also increased the explosive's bulk strength by increasing the density of explosive material in the mixture. Emulsions, however, also have a disadvantage. Emulsions will not detonate

unless sensitized. Sensitivity of a blasting composition refers to the ease of igniting its explosion. Experts generally sensitize emulsions by using gassing agents or adding microballoons throughout the mixture. The gassing agents or microballoons provide tiny gas or air bubbles throughout the mixture. Upon detonation, the gas pockets compress and heat up, thereby igniting the fuel around them. In other words, the tiny gas or air bubbles act as "hot spots" to propagate the explosion.

The Clay patent and its reissue both claim composite explosives made from the combination of an ANFO blasting composition and an unsensitized water-in-oil emulsion. Both patents claim essentially the same blasting composition. Claim one of the reissue patent recites:

1. A blasting composition consisting essentially of 10 to 40% by weight of a greasy water-in-oil emulsion and 60 to 90% of [**4] a substantially undissolved particulate solid oxidizer salt constituent, wherein the emulsion comprises about 3 to 15% by weight of water, about 2 to 15% of oil, 70 to 90% of powerful oxidizer salt comprising ammonium nitrate which may include other powerful oxidizer salts, wherein the solid constituent comprises ammonium nitrate and *in which sufficient aeration is entrapped to enhance sensitivity to a substantial degree*, and wherein the emulsion component is emulsified by inclusion of 0.1 to 5% by weight, based on the total composition, of an [oil-in-water] water-in-oil emulsifier to hold the aqueous content in the disperse or

internal phase.

(Underline added.)

When this lawsuit began, Atlas was the exclusive licensee under the Clay patent in the continental U.S. and Hawaii. Atlas commenced this lawsuit against IRECO in 1986, alleging infringement of the Clay patent. During the course of litigation, Dr. Robert Clay, the inventor, filed a reissue petition with the United States Patent and Trademark Office (PTO). Atlas then moved to stay the litigation pending resolution of the reissue application. The district court denied that motion and conducted a first bench trial [**5] on the issues of validity and infringement of the Clay patent in October 1986. Dr. Clay then requested suspension of prosecution of the reissue application by the PTO in February 1987. After waiting several years for a decision from the district court, Dr. Clay requested that the PTO reinstate the reissue proceedings in 1990. In January 1992, the Clay reissue patent issued upon surrender of the original patent. Later that [*1345] year, the district court rendered its findings and judgment regarding the validity and infringement of the Clay patent.

In its 1992 judgment, the district court found claims 1, 2, 3, 10, 12, 13, and 14 of the Clay patent invalid as anticipated by either one of two prior art references, Egly or Butterworth. Egly and Butterworth each disclose blasting compositions containing a water-in-oil emulsion and ANFO with ingredients identical to those of the Clay patents in overlapping amounts. The following chart illustrates the overlap between the explosive compositions disclosed in the prior art patents and the Clay reissue patent:

	Clay	Egly	Butterworth
Composition contents:			
Water-in-oil Emulsion	10-40%	20-67%	30-50%
Solid Ammonium Nitrate	60-90%	33-80%	50-70%
Emulsion contents:			
Ammonium Nitrate	70-90%	50-70%	65-85%
Water	about 3-15%	about 15-about 35%	2-27%

	Clay	Egley	Butterworth
Fuel Oil	about 2-15%	about 5-about 30%	2-27%
Emulsifier	0.1-5%	about 1-5%	0.5-15%

The only element of the Clay patent claims which is arguably not present in the prior art compositions is "sufficient [**6] aeration . . . entrapped to enhance sensitivity to a substantial degree." The trial court determined that "sufficient aeration" was an inherent element in the prior art blasting compositions within the overlapping ranges. The district court also found that none of the accused products infringed any of the asserted claims. The 1992 judgment was not final, however, and specifically reserved a decision on the effect of the reissue patent for phase two of the case.

On September 22, 1993, the district court granted Hanex Products Inc.'s (Hanex) motion to intervene in the lawsuit. Hanex owns the two patents and had licensed them to Atlas. Hanex asserted the same claim of patent infringement against IRECO that Atlas had asserted, but also initiated a declaratory judgment action against ICI Explosives USA, Inc. (ICI), Atlas' successor-in-interest, seeking the sole right to control the litigation. In July 1994, the district court granted declaratory relief in favor of Hanex, against ICI, giving Hanex the sole right to control and direct the litigation on the two patents.

After the reissue patent issued, the district court conducted a second bench trial, in January 1996, on the issues of phase [**7] two. Specifically, the district court considered whether reissue affected its 1992 judgment. On September 25, 1998, the district court rendered its final judgment finding claims 1, 2, 3, 10, 12, 13, and 14 of the Clay reissue patent invalid as anticipated and finding that IRECO had not infringed any of the asserted claims. Despite the PTO's consideration of the Egley and Butterworth references during prosecution of the reissue, the district court concluded that IRECO had overcome the Clay reissue patent's presumption of validity under 35 U.S.C. § 282 (1994) by clear and convincing evidence. The district court noted that IRECO presented a great deal of testimonial and documentary evidence on inherent disclosures of the prior art that was not before the PTO in the [*1346] reissue proceeding. Hanex appealed to this court from the 1998 final judgment.

II.

This court reviews claim construction as a matter of law. *See Cybor Corp. v. FAS Techs., Inc.*, 138 F.3d 1448, 1451, 46 U.S.P.Q.2D (BNA) 1169, 1173 (Fed. Cir. 1998) (en banc); *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 979, 34 U.S.P.Q.2D (BNA) 1321, 1326 (Fed. Cir. 1995) (en banc). Anticipation is [**8] a question of fact, including whether or not an element is inherent in the prior art. *See In re Schreiber*, 128 F.3d 1473, 1477, 44 U.S.P.Q.2D (BNA) 1429, 1431 (Fed. Cir. 1997). Therefore, this court reviews a finding of anticipation under the clearly erroneous standard. *See Gechter v. Davidson*, 116 F.3d 1454, 1457, 43 U.S.P.Q.2D (BNA) 1030, 1032 (Fed. Cir. 1997).

"To anticipate a claim, a prior art reference must disclose every limitation of the claimed invention, either explicitly or inherently." *In re Schreiber*, 128 F.3d at 1477. Anticipation of a patent claim requires a finding that the claim at issue "reads on" a prior art reference. *See Titanium Metals Corp. v. Banner*, 778 F.2d 775, 781, 227 U.S.P.Q. (BNA) 773, 778 (Fed. Cir. 1985). In other words, if granting patent protection on the disputed claim would allow the patentee to exclude the public from practicing the prior art, then that claim is anticipated, regardless of whether it also covers subject matter not in the prior art. *See id.* at 781. Specifically, when a patent claims a chemical composition in terms of ranges of elements, any single prior art reference that falls [**9] within each of the ranges anticipates the claim. *See id.* at 780-82 ("It is also an elementary principle of patent law that when, as by a recitation of ranges or otherwise, a claim covers several compositions, the claim is 'anticipated' if one of them is in the prior art."). In chemical compounds, a single prior art species within the patent's claimed genus reads on the generic claim and anticipates. *See In re Gosteli*, 872 F.2d 1008, 1010, 10 U.S.P.Q.2D (BNA) 1614, 1616 (Fed. Cir. 1989).

As noted previously, both Egley and Butterworth disclose blasting compositions with ingredients identical to those of the Clay patent and its reissue in overlapping amounts. The only element which is arguably missing

from the prior art is the requirement that "sufficient aeration [be] entrapped to enhance sensitivity to a substantial degree." To decide the issue of anticipation, therefore, the district court examined whether "sufficient aeration . . . to enhance sensitivity" was inherently part of the prior art compositions. That decision, in turn, required the trial court to interpret the claim term "sufficient aeration." By looking at the express language of the claims and [*10] the patent's written description, the district court concluded that the claim term "sufficient aeration" included both interstitial air (between oxidizer particles) and porous air (within the pores of oxidizer particles).

The first task of this court on appeal is to construe independently the disputed claim term. This question requires this court to determine whether the claim term "sufficient aeration" includes porous air, as the trial court determined. The claim term "sufficient aeration" does not limit the air content of the composition to interstitial air. Rather, the broad term "aeration" contains no qualitative limits on the kind of air exposure, only the quantitative limit that the air exposure be "sufficient" to enhance sensitivity. If the inventor intended "sufficient aeration" to carry qualitative limits, he also did not express that intention in the patent's written description. The specification gives no explicit definition of the phrase "sufficient aeration . . . to enhance sensitivity," which appears in the patent for the first time in the claims.

[*1347] It is, of course, possible that the inventor did not include qualitative limits on the term "sufficient aeration" in the [*11] specification because those of ordinary skill in the art understand that only interstitial air enhances sensitivity and satisfies the claim's language. See *Autogiro Co. of Am. v. U.S.*, 181 Ct. Cl. 55, 384 F.2d 391, 397, 155 U.S.P.Q. (BNA) 697 (Ct. Cl. 1967) ("Claims cannot be clear and unambiguous on their face."); *Markman*, 52 F.3d at 986 ("The focus in construing disputed terms in claim language is . . . on the objective test of what one of ordinary skill in the art at the time of the invention would have understood the term to mean."). The trial record, however, shows that those of ordinary skill in this art at the time the patent application was filed knew that both interstitial and porous air enhance sensitivity. Dr. Clay himself, the inventor of the patents in suit, testified that air from any source would contribute to the explosion of a heavy ANFO composition and, particularly, air trapped within the pores of porous prilled AN. Therefore, this court detects

no error in the district court's conclusion that "sufficient aeration . . . to enhance sensitivity" is understood by those of ordinary skill in the art to include both interstitial and porous air. [*12] The district court appropriately construed the claims at issue to include aeration from both sources.

III.

Based on its correct interpretation of "sufficient aeration," the district court heard evidence on whether both interstitial and porous air were present and enhanced sensitivity in the prior art explosive compositions. Based on the evidence, the district court concluded that IRECO had shown the inherency of the disputed claim element in the prior art and overcome "the presumption of validity under 35 U.S.C. § 282 by providing clear and convincing evidence of invalidity." This court must determine whether the district court committed clear error by determining that the evidence clearly and convincingly established that "sufficient aeration . . . to enhance sensitivity" was inherent in either Egly or Butterworth.

To invalidate a patent by anticipation, a prior art reference normally needs to disclose each and every limitation of the claim. See *Standard Havens Prods., Inc. v. Gencor Indus., Inc.*, 953 F.2d 1360, 1369, 21 U.S.P.Q.2D (BNA) 1321, 1328 (Fed. Cir. 1991). However, a prior art reference may anticipate when the claim limitation or limitations [*13] not expressly found in that reference are nonetheless inherent in it. See *id.*; *Verdegaal Bros., Inc. v. Union Oil Co. of Cal.*, 814 F.2d 628, 630, 2 U.S.P.Q.2D (BNA) 1051, 1053 (Fed. Cir. 1987). Under the principles of inherency, if the prior art necessarily functions in accordance with, or includes, the claimed limitations, it anticipates. See *In re King*, 801 F.2d 1324, 1326, 231 U.S.P.Q. (BNA) 136, 138 (Fed. Cir. 1986). Inherency is not necessarily coterminous with the knowledge of those of ordinary skill in the art. See *Titanium Metals*, 778 F.2d at 780. Artisans of ordinary skill may not recognize the inherent characteristics or functioning of the prior art. See *id.* at 782. However, the discovery of a previously unappreciated property of a prior art composition, or of a scientific explanation for the prior art's functioning, does not render the old composition patentably new to the discoverer. See *id.* at 782 ("Congress has not seen fit to permit the patenting of an old [composition], known to others . . . by one who has discovered its . . . useful properties."); *Verdegaal Bros.*, 814 F.2d at 633. [*14]

This court's decision in *Titanium Metals* illustrates these principles. See *Titanium Metals*, 778 F.2d at 775. In *Titanium Metals*, the patent applicants sought a patent for a titanium alloy containing various ranges of nickel, molybdenum, iron, and [*1348] titanium. The claims also required that the alloy be "characterized by good corrosion resistance in hot brine environments." *Titanium Metals*, 778 F.2d at 776. A prior art reference disclosed a titanium alloy falling within the claimed ranges, but did not disclose any corrosion-resistant properties. This court affirmed a decision of the PTO Board of Appeals finding the claimed invention unpatentable as anticipated. This court concluded that the claimed alloy was not novel, noting that "it is immaterial, on the issue of their novelty, what inherent properties the alloys have or whether these applicants discovered certain inherent properties." *Id.* at 782. This same reasoning holds true when it is not a property, but an ingredient, which is inherently contained in the prior art. The public remains free to make, use, or sell prior art compositions or processes, regardless of whether or [*15] not they understand their complete makeup or the underlying scientific principles which allow them to operate. The doctrine of anticipation by inherency, among other doctrines, enforces that basic principle.

The trial record contains exhaustive evidence regarding the inherency of both interstitial and porous air in the Egly and Butterworth compositions within the overlapping ranges. The testimony from expert witnesses for both parties established that whether sufficient air is present in the explosive composition to facilitate detonation is a function of the ratio of the emulsion to the solid constituent. Dr. Clay testified that "if you mix porous prills, for example, with 30% typical water-in-oil emulsions, you're going to have air in there and it will detonate." Another of Atlas' experts testified that a mixture of 30% of either an Egly or a Butterworth emulsion, mixed with 70% standard fertilizer grade porous AN would have interstitial air, assuming nothing was done to disturb the size distribution of the AN prills. The other experts agreed that the emulsions described in both Egly and Butterworth would inevitably and inherently have interstitial air remaining in the mixture up [*16] to a ratio of approximately 40% emulsion to 60% solid constituent. The expert testimony supports the district court's conclusion that "sufficient aeration" is inherent in both Egly and Butterworth.

The district court also relied on evidence from

several tests which showed that "sufficient aeration . . . to enhance sensitivity" was inherently present within the overlapping ranges of the Clay patents and Egly and Butterworth. In tests conducted with porous prilled AN combined with FO, stable detonations were obtained in every 8" diameter bore hole test where the percentage of emulsion ranged from 30% to 42.5%. Butterworth specifically discloses the use of porous prilled AN. Butterworth, p. 3, ll. 35-50. These tests, therefore, support the finding that "the emulsions described by Butterworth, combined with the ratios of ANFO disclosed by Butterworth, would inevitably and inherently have interstitial air remaining up to approximately 40% emulsion." The district court also found that the solid AN disclosed in Egly would have included porous prills. These tests, therefore, further support the court's finding that "emulsions described in the Egly Patent, combined with either AN or ANFO, [*17] would inevitably and inherently have interstitial air remaining in the mixture up to approximately 40% emulsion to 60% solid constituent." This court discerns no clear error in the district court's conclusion that "sufficient aeration" was inherent in each anticipating prior art reference.

Because "sufficient aeration" was inherent in the prior art, it is irrelevant that the prior art did not recognize the key aspect of Dr. Clay's alleged invention - that air may act as the sole sensitizer of the explosive composition. An inherent structure, composition, or function is not [*1349] necessarily known. See, e.g., *In re King*, 801 F.2d at 1327; *Titanium Metals*, 778 F.2d at 782. Once it is recognized that interstitial and porous air were inherent elements of the prior art compositions, the assertion that air may act as a sole sensitizer amounts to no more than a claim to the discovery of an inherent property of the prior art, not the addition of a novel element. Insufficient prior understanding of the inherent properties of a known composition does not defeat a finding of anticipation. See *Titanium Metals*, 778 F.2d at 782. In addition, there [*18] was evidence that Butterworth did recognize the functioning of interstitial and porous air in sensitizing the composition. Butterworth recognizes the need for a gaseous sensitizer. Butterworth, p. 2, ll. 38-56. It teaches that the "sensitizer may be a gaseous sensitizer present in the composition in the form of gas bubbles or discrete particles containing an entrapped gas such as air." *Id.*, p. 2, ll. 41-45. Although this typically suggests use of a gassing agent or microballoons, Butterworth expressly recognizes that in

certain ranges (i.e., 50% to 70% by weight of ANFO) the mixture of porous prilled AN and FO alone provides the necessary sensitization. *See id.*, p. 3, ll. 37-50. The district court found that Butterworth thus inherently appreciates that interstitial and porous air may serve as the necessary sensitizer. This court discerns no clear error in that finding.

In reaching this judgment, this court notes that Egly teaches away from air entrapment. Specifically, Egly teaches that it is desirable to "fill all spaces in between each particle to give added density." Egly, col. 1, ll. 26-27. This statement in Egly, however, does not defeat the district court's finding of [*19] anticipation for several reasons. First, Egly's teaching does not in any way discredit the trial court's alternative reliance on Butterworth for invalidation of the Clay patent and its reissue. More important, the statement in Egly is, in fact, only a showing that Egly did not recognize the function of the inherently present interstitial air. As noted previously, an insufficient scientific understanding does not defeat a showing of inherency. In fact, even in Egly itself, the only way taught for removing interstitial air is the addition of more emulsion. *See id.*, col. 1, ll. 50-55. Egly, however, teaches the use of a broad range - between 20% and 67% by weight - of water-in-oil emulsion. *See id.*, col. 3, ll. 21-24. While Egly compositions containing amounts approaching 67% by weight of water-in-oil emulsions may have little or no entrapped air, the evidence established that at emulsion levels below 40%, Egly compositions "inevitably and inherently" trap sufficient amounts of air to enhance sensitivity. This evidence included both substantial amounts of expert testimony and data showing extensive testing of Egly compositions.

Finally, although the record showed that special [*20] mixing techniques - such as grinding and screening the AN particles - remove interstitial air from the blasting compositions, Egly did not teach or suggest any such techniques. Thus, although Egly may have suggested removal of air, it nonetheless inherently contained interstitial aeration sufficient to enhance sensitivity when comprised of elements within the Clay patent ranges. Consequently, this court discerns no clear error in the district court's conclusion that Egly

compositions within the range of the Clay patent claims inherently contain sufficient air to enhance sensitivity.

Based upon all the evidence, substantial amounts of which were not before the PTO in its reissue examination, the district court concluded that IRECO had proven

clearly and convincingly that, unless extraordinary measures are taken to grind and screen ammonium nitrate, the existence of "interstitial air," or sufficient [*1350] aeration to sustain a stable detonation, is a function of the ratios of emulsion to solid constituent. Specifically, at ratios of 30% emulsion and 70% solid constituent, which are common to the Clay Patent, the Egly Patent, and the Butterworth Patent, there is inherently sufficient [*21] aeration to sustain a stable detonation, barring extraordinary efforts to grind and screen the ammonium nitrate used in the solid constituent.

This court discerns no clear error in the district court's factual determination that the prior art inherently possesses sufficient aeration to enhance sensitivity to a substantial degree within the overlapping ranges. Nor does this court discern clear error in the district court's finding of anticipation based on either Egly or Butterworth. To uphold the Clay patent and its reissue would preclude the public from practicing the prior art.

III.

In conclusion, this court affirms the district court's finding of invalidity with respect to claims 1, 2, 3, 10, 12, 13, and 14 of the Clay patent and the Clay reissue patent. This court therefore does not address the district court's additional finding of non-infringement.

COSTS

Each party shall bear its own costs.

AFFIRMED.

LEXSEE 79 F. SUPP. 2D 422

BIACORE, AB, and BIACORE, INC., Plaintiffs, v. THERMO BIOANALYSIS CORP., Defendant.

Civil Action No. 97-274-SLR

UNITED STATES DISTRICT COURT FOR THE DISTRICT OF DELAWARE*79 F. Supp. 2d 422; 1999 U.S. Dist. LEXIS 20273*

December 30, 1999, Decided

SUBSEQUENT HISTORY: Counsel Corrected January 14, 2000.**DISPOSITION:** [*1] Plaintiffs' motion for injunction granted.**COUNSEL:** Edward M. McNally, Esquire, and Richard D. Kirk, Esquire, of Morris, James, Hitchens & Williams, Wilmington, Delaware, attorneys for plaintiffs. Of Counsel: Marc R. Labgold, Esquire, of Long, Aldridge & Norman, Washington, D.C., and Arthur I. Neustadt, Esquire, Jeffrey B. McIntyre, Esquire, and Ron Myers, Esquire, of Oblon, Spivak, McClelland, Maier & Neustadt, P.C., Arlington, Virginia.

Rudolph E. Hutz, Esquire; N. Richard Powers, Esquire; and Richard D. Levin, Esquire, of Connolly, Bove, Lodge & Hutz, Wilmington, Delaware, attorneys for defendant.

JUDGES: Sue L. Robinson, District Judge.**OPINION BY:** Sue L. Robinson**OPINION**

[*426] Dated: December 30, 1999

Wilmington, Delaware

ROBINSON, District Judge**I. INTRODUCTION**

Plaintiffs Biacore, AB and Biacore, Inc. (collectively "Biacore") filed this suit pursuant to 35 U.S.C. § 271

against defendant Thermo Bioanalysis Corporation ("Thermo") on May 29, 1997, seeking damages (lost profit damages) and an injunction for alleged infringement of a patent that is directed to a matrix coating suitable for use in a biosensor. (D.I. 1) Specifically, Biacore charges that Thermo willfully [*2] infringed *U.S. Patent No. 5,436,161* (the "*161 patent*") entitled "Matrix Coating for Sensing Surfaces Capable of Selective Biomolecular Interactions, To Be Used in Biosensor Systems," issued July 25, 1995.¹ (D.I. 1) Biacore also alleges that Thermo is inducing infringement of the patent-in-suit.

1 The '*161 patent*' is a continuation of Serial No. 058,265, filed May 10, 1993, abandoned, which was a continuation of Serial No. 681,531, filed November 9, 1989 as PCT/EP89/00642, now *U.S. Patent No. 5,242,828* (the "*'828 patent*"), issued September 7, 1993. See discussion *infra* Part II.D.

Thermo denies infringement and has counterclaimed for a declaratory judgment of invalidity and noninfringement of the '*161 patent*'. Thermo challenges the validity of the '*161 patent*' under 35 U.S.C. §§ 102 ("anticipation"), 103 ("obviousness"), and 112 ("written description"). Specifically, Thermo charges that: (1) the patented invention was described in a printed, prior art publication before its development [*3] by the patentee (§ 102); (2) the differences between the patented invention and the prior art are such that the claims would have been obvious to one of ordinary skill in the pertinent art (§ 103); and (3) the subject matter of the '*161 patent*' is not disclosed in sufficient detail in the written description of the grandparent application (§ 112).²

2 Thermo argues, with respect to the written

description requirement, that the claims of the '161 patent contain new matter not adequately supported in the grandparent application on which the '161 patent relies for priority. Consistent with this argument, Thermo contends that the claims are entitled only to a filing date of May 10, 1993, the date they were initially presented to the Patent and Trademark Office ("PTO"). See discussion infra Part III.C.3.

The court has jurisdiction over this matter pursuant to 28 U.S.C. § 1338(a).

The parties tried this matter to the court from October 26, 1998 to November 2, 1998. Despite having [**4] identified in the pre-trial order claims 1-5, 9-11, and 15 as allegedly infringed by Thermo (D.I. 96), "for purposes of trial" Biacore reduced the number of claims, asserting only claims 4 and 5. (D.I. 103 at 4) The following constitutes the court's findings of fact and conclusions of law pursuant to *Fed.R.Civ.P. 52(a)*.

II. FINDINGS OF FACT

A. The Parties

1. Biacore. AB is a Swedish corporation with its principal place of business in Uppsala, Sweden. (D.I. 103 at 80; D.I. 1, P. 2) Prior to October 1996, Biacore, AB was a subsidiary of the Swedish company Pharmacia AB, operating under the name Pharmacia Biosensor, AB. (D.I. 103 at 78-79) In 1996, Pharmacia AB merged with UpJohn Pharmaceuticals and Biacore, AB was spun off. (D.I. 103 at 78-79) Biacore, AB's business is totally dedicated to the development, manufacturing, and marketing of affinity biosensors. (D.I. 103 at 80) Since 1990, it has sold its optical biosensor systems in the United States under the trade name BIAcore TM. Biacore, AB is the owner of the '161 patent. (D.I. 96 at 2)

2. Biacore, Inc. is a Delaware corporation with its principal place of business in Piscataway, New Jersey. (D.I. 1, P. 2) It is [**5] the U.S. subsidiary of Biacore, AB and is responsible for the marketing and selling of BIAcore TM optical biosensors in the United States. (D.I. 103 at 79) The BIAcore TM biosensors sold by Biacore, Inc. [**427] are manufactured in Biacore, AB's facilities in Uppsala, Sweden. (D.I. 103 at 80)

3. Thermo is a Delaware corporation with its principal place of business in Santa Fe, New Mexico. ³

(D.I. 1, P. 3) Since 1994, Thermo has marketed and sold its optical biosensor systems in the United States under the trade name IASys TM through its Affinity Sensors ⁴ division. (D.I. 105 at 413-14)

3 Thermo is a majority owned subsidiary of Thermo Instrument which, in turn, is a subsidiary of Thermo Electron.

4 Prior to 1996, Affinity Sensors was owned by Fisons and operated under the name Applied Sensors Technology. (D.I. 105 at 414) In 1996, Fisons transferred the Affinity Sensors business to Thermo. (D.I. 105 at 414)

B. The Field of the Invention

4. **Biosensors.** The subject matter of the '161 patent relates [**6] to "the field of biosensors." (Plaintiffs' Exhibit ("PX") 1, col. 1, lns. 15-16) A biosensor is

an analytical device comprising a biological or biologically derived sensing element which is either intimately associated with or integrated within a physical chemical transducer where the transducer may be, for example, optical, electrochemical, piezoelectric, thermoelectric or magnetic.

(D.I. 104 at 266) Generally,

the usual aim [of a biosensor] is to produce a digital electronic signal which is proportional to the concentration of a specific chemical or set of chemicals.

(Defendant's Exhibit ("DX") 574 at 3) Biosensors are employed in biomolecular interaction analysis, i.e., the study and characterization of the interactions between biologically active molecules. (D.I. 103 at 74-75) For example, in the pharmaceutical industry, biosensors are used to study the binding of a novel drug to the targeted receptor. (D.I. 103 at 75) Biosensors also are employed in the fermentation and bioprocessing, petro- and agrochemical, and pollution industries. (DX 513 at 19-20)

5. A biosensor is composed of two essential elements: (1) a biorecognition system and (2) a [**7] transducer. (PX 1, col. 1, lns. 23-27; DX 513 at 20) In general, biosensors function by first immobilizing on a surface within the instrument ligands or receptors (e.g.,

whole cells, enzymes, lectins, antibodies, or receptor proteins) that are able to recognize target molecules (analytes ⁵) over a host of other biomolecules. (D.I. 103 at 183; D.I. 104 at 219-20; DX 513 at 20) The bound ligands then are contacted with a solution or suspension containing analytes having specific recognition sites such that they will bind to the ligands. (D.I. 104 at 218-20) Generally speaking, the binding of an analyte to a ligand (i.e., the biological recognition event) results in a change in one or more parameters associated with the interaction. (DX 513 at 22) The transducer element of the biosensor functions to respond to the products of the biological recognition event, ⁶ converting the physico-chemical signal into a signal (e.g., an electrical output) that can be either visualized or processed in some fashion, e.g., via a computer. (D.I. 104 at 267; DX 513 at 22)

5 An analyte is "the ion or compound that is being measured (determined) in a given analytical procedure." Dictionary of Biochemistry and Molecular Biology 26 (2d ed. 1989) (hereinafter Dictionary of Biochemistry).

[**8]

6 There are two broad subclasses of biological recognition events: catalytic, where there is some chemical conversion, and affinity, where only a binding event takes place. (D.I. 104 at 268)

6. Biosensors employ a number of different types of transduction technologies. These technologies include thermister, electrochemical, potentiometric, optical, piezoelectric crystal, and amperometric transduction. (DX 574 at 3-4; DX 960; D.I. 106 at 759-60) Particularly relevant to the case at bar, optical biosensors employ an optical transducer that "detect[s] the change which is caused in the optical properties of a surface layer due to the interaction [428] of the receptor with the surrounding medium." (PX 1, col. 1, lns. 28-31; D.I. 104 at 267) One type of optical biosensor, an evanescent wave optical biosensor, exploits the energy that is propagated beyond a reflecting surface, i.e., the evanescent wave. ⁷ These biosensors "bring[] about or effect[] changes in the reflecting light as a result of interacting with the evanescent field," i.e., by "taking advantage of the change in refractive index causing [**9] differences in the light signal." (D.I. 104 at 267-68)

7 An evanescent wave is an "electromagnetic field that decays exponentially away from the surface but propagates along the surface." (D.I.

27, Ex. K at 515)

7. One type of evanescent wave technology relies on the phenomenon of surface plasmon resonance ("SPR"). SPR "is a quantum optical-electrical phenomenon that arises from the interaction of light with a suitable metal or semiconductor surface." (D.I. 27, Ex. K at 516) Under certain conditions, the photon's energy is transferred to plasmons on the surface of the metal or semiconductor. (D.I. 27, Ex. K at 516) The wavelength that excites the plasmons, the resonance wavelength, can be calculated by measuring the amount of light reflected from the surface. (D.I. 27, Ex. K at 516) The resonance wavelength is determined by the interaction between the plasmon's electric field and the matter within the field; thus, any change in the composition of the matter alters the resonance wavelength. (D.I. 27, Ex. K at [**10] 516-17) The magnitude of the change in the resonance wavelength is directly proportional to the change in composition of the surface. (D.I. 27, Ex. K at 516-17) As a result, SPR can be "exploited as a direct optical sensing technique that allows the real-time measurement of interfacial refractive index (dielectric) changes . . . made at suitable metal or dielectric surfaces . . . without the use of labels or probes." (D.I. 27, Ex. K at 518) SPR optical biosensor technology, therefore, is a method whereby "changes in the refractive index in a layer close to a thin metal film are detected by consequential changes in the intensity of a reflected light beam." (PX 1, col. 1, lns. 44-47) Biacore's biosensors employ SPR technology.

8. Another type of evanescent wave system technology employs "an integrated optical chip called the resonant mirror (RM)," which "comprises a glass prism with the top surface coated with a low refractive index silica spacer layer which is in turn coated with a thinner high refractive index monomode wave-guide of titania, hafnia or silican nitride. This is then coated with the bioselective layer." (D.I. 27, Ex. K at 519) In operation, a laser light directed at [**11] the prism "is repeatedly swept through an arc of specific angles," generating, inter alia, an evanescent wave at the waveguide surface that penetrates into the sample. (D.I. 27, Ex. K at 519-20) "This wave detects surface binding events by detecting the changes in the refractive index which in turn change the resonance angle that is tracked by diode arrays." (D.I. 27, Ex. K at 520) Thermo's biosensors employ a resonant mirror.

9. **Hydrogel.** The '161 patent specifically discloses a

matrix coating that is comprised of a hydrogel. A gel, of which a hydrogel is a type, is "a solid colloidal dispersion consisting of a network of particles and a solvent that is immobilized in this network." Dictionary of Biochemistry 192. A hydrogel is a material that imbibes or absorbs a large amount of water, a common example of which is gelatin. (D.I. 106 at 760-61) Because hydrogels are composed mostly of water, thus resembling the environment in which most biomolecules are found, they have good biocompatibility, i.e., bound biomolecules are more likely to be stable. (D.I. 106 at 761-62) Polysaccharide:⁸ hydrogels and water-swellaible polymer hydrogels are conventional [*429] ligand immobilization [*12] reagents. (DX 574 at 2)

8 A polysaccharide is a polymeric material composed of more than ten monosaccharides (sugars) linked by glycosidic bonds. See Dictionary of Biochemistry 374.

10. **Ligand Immobilization.** In the context of the technology at issue, a ligand is a molecule that binds to a macromolecule. See Dictionary of Biochemistry 273. Ligand immobilization is a method of fixing a biomolecule to a surface in some particular orientation. (D.I. 106 at 752-53) This procedure has long been employed in various types of chromatography. (D.I. 104 at 242-44) Although there are many ways by which to bind ligands to a surface, with respect to the technology at issue, they are immobilized via covalent bonding⁹ with reactive groups in the hydrogel matrix. (D.I. 106 at 752-53) In addition to biosensor technology, ligand immobilization is used in a wide variety of fields, including diagnostic assays, enzyme immobilization, and protein purification. (D.I. 106 at 753)

9 A covalent bond is "formed between two atoms and consist[s] of one or more shared pairs of electrons such that one electron in a pair is donated by each of the two bonded atoms." Dictionary of Biochemistry 105. A covalent bond "creates an integral molecule." (D.I. 106 at 753)

[*13] 11. **Activation.** According to the '161 patent, the hydrogel is activated to contain two types of chemical groups: charged groups capable of concentrating oppositely-charged biomolecules and reactive groups capable of covalently binding the concentrated biomolecules. In the context of ligand immobilization, "activated" refers to the state of reactivity required to covalently bind another

biomolecule under conditions that would not result in alteration of the biomolecule itself, with the exception of that alteration necessary to allow for the covalent binding. (D.I. 106 at 762) In contrast to activated groups, which are able to react with and bind a biomolecule under the mild conditions necessary for biomolecule immobilization, reactive groups react under reasonable, or "normal," conditions. (D.I. 106 at 766) Charged groups, as that term is understood in the art of ligand immobilization, are groups containing either a positive or negative charge. (D.I. 106 at 764) They function to concentrate or attract oppositely-charged biomolecules. (D.I. 106 at 764) In general, the term "charged groups" describes the use of an electrostatic concentration. (D.I. 107 at 867)

12. In the context [*14] of the '161 patent, the ligands are concentrated into the hydrogel matrix via the electrostatic charge created by the presence of oppositely-charged groups incorporated into the hydrogel. (D.I. 107 at 867-68) The reactive groups in the hydrogel then act to covalently bind the concentrated ligands to the hydrogel in an orientation that preserves the ligands' affinity¹⁰ function. (D.I. 107 at 868) As a result, the immobilized ligands are able to attract the analytes from the solution. (D.I. 107 at 868)

10 In the context of the technology at issue, affinity is the capacity of a ligand to bind the desired analyte. See Dictionary of Biochemistry 13.

C. The Technology Developed by the Biacore Researchers

13. As of 1983, a number of obstacles faced researchers attempting to develop a functional biosensor. These problems had to do with capacity, activity, and nonspecific binding. (D.I. 103 at 188-90; D.I. 104 at 271-72) With regard to capacity, the two-dimensional (i.e., planar) surfaces employed in the [*15] prototypical biosensor limited the amount of available surface area. (D.I. 103 at 188-90; D.I. 104 at 271-72) Even if the ligands were tightly packed on the surface, there was insufficient ligand immobilization to yield a signal that would be of use for biosensor purposes. (D.I. 103 at 188-90; D.I. 104 at 271-72) The capacity problem was exacerbated by the activity problem, which was two-fold. (D.I. 103 at 188-90; D.I. 104 at 271-72) Specifically, the ligands would bind to the surface in an orientation that would prevent them from interacting with

the analytes. [*430] (D.I. 103 at 188-90; D.I. 104 at 271-72) Moreover, direct adsorption often would cause the ligands to denature, i.e., breakdown, thereby losing their ability to function. (D.I. 103 at 188-90; D.I. 104 at 271-72) Finally, nonspecific binding, i.e., unwanted binding events at the surface, would contribute to the signal coming from the biosensor unit and thereby confound the data. (D.I. 103 at 188-90; D.I. 104 at 271-72) In addition, a problem specific to evanescent wave optical biosensors concerned maximizing the biomolecular interactions throughout the available detection field, which extends a few hundred nanometers above the [*16] sensor surface. (D.I. 104 at 271; PX 33 at 101020)

14. In 1984, Pharmacia, AB created a division, Pharmacia Biosensor, AB ("Pharmacia"), solely for the purpose of developing a functional affinity-based biosensor for the study of biomolecular interaction. (D.I. 103 at 71-72; PX 360 at BIA 003080-81) Interest in the field had been stimulated by the publication in 1983 of an article by researchers at Linköping University in Sweden demonstrating, for the first time, the use of SPR for biosensing applications. (D.I. 104 at 269-70, 275-74) Competition in the field was high. (D.I. 104 at 275) Initially, the Pharmacia researchers employed functioning coupling reagents and methods that were being used at that time for affinity chromatography and enzyme immobilization. (D.I. 104 at 247-48) They worked with two-dimensional silicon surfaces, immobilizing ligands via either silanization of the surface or direct adsorption. (D.I. 103 at 185-87) Neither method, however, yielded a workable or usable biosensor as the aforementioned salient problems persisted. (D.I. 103 at 187)

15. By September 1985, the Pharmacia researchers had introduced hydrogels to the surface in an attempt to decrease, or obviate [*17] altogether, the incidence of nonspecific binding. (D.I. 103 at 190; D.I. 104 at 274) At that time, it was known that hydrogels, because they are highly water-solvated, form a biocompatible surface. (D.I. 104 at 274; D.I. 106 at 761-62) The Pharmacia researchers believed that the attachment of a hydrogel would hamper the ability of undesired biomolecules (i.e., biomolecules other than the analytes) to contact the surface, thereby minimizing nonspecific binding, while at the same time displaying the required ligand. (D.I. 103 at 190-91; D.I. 104 at 275) In addition, the introduction of a hydrogel would create a three-dimensional matrix thus increasing capacity and exploiting the evanescent wave

phenomenon to the greatest extent. (D.I. 103 at 191; D.I. 104 at 267-68, 273-74) Finally, the researchers postulated that attachment of ligands to a fluid hydrogel structure, rather than a planar surface, would not only increase accessibility, resulting in a commensurate increase in activity, but would also decrease the incidence of ligand denaturation. (D.I. 103 at 191; D.I. 104 at 274)

16. The first hydrogel employed by the Pharmacia researchers was dextran. (D.I. 103 at 192) At that time dextran, [*18] a naturally occurring polysaccharide, was being used in chromatography procedures as a matrix for the binding of biomolecules. (D.I. 104 at 244; PX 1 col. 6, ln. 6) The researchers selected dextran because it was a biocompatible and, ostensibly, inert material. (D.I. 103 at 192; D.I. 104 at 233; D.I. 106 at 762) Moreover, it was readily available in different grades from Pharmacia. (D.I. 103 at 192; D.I. 104 at 232-33) The fact that dextran was thought to be inert was important to the Pharmacia researchers, who wished to avoid any nonspecific binding caused by charged interactions between the nonanalyte biomolecules in the solution and charged groups on the biosensor surface. (D.I. 103 at 192)

17. Although dextran's inert nature was beneficial with respect to reducing nonspecific binding, it was a disadvantage with respect to immobilizing ligands. (D.I. 103 at 192; PX 489 at 289) Therefore, the Pharmacia researchers sought to modify the dextran by introducing reactive groups that could covalently bind ligands [*431] into the dextran. (D.I. 103 at 192-94) The scientists experimented with a variety of conventional reagents, including allyglycidylether, cyanodimethylpyridin, carbonyldiimidazole, [*19] and trisyl chloride. ¹¹ (D.I. 103 at 192-94) In each instance, however, the modified dextran failed to yield a matrix suitable for use in a biosensor, i.e., the signal produced was not "good enough" because an insufficient amount of active ligand was bound. (D.I. 103 at 193)

11 Dextran modified with these agents would contain only reactive groups.

18. In the summer of 1986, having failed to produce a workable matrix, the Pharmacia researchers began exploring the possibility of employing SPR technology techniques that had been developed elsewhere in the company for use in nonbiosensor applications. (D.I. 103 at 195) Specifically, the researchers began to experiment with charged hydrogel surfaces, conjecturing that these surfaces would interact with ligands by electrostatic

attraction. ¹² (D.I. 103 at 195) The results of the experiments demonstrated that, by using a dextran hydrogel matrix possessing both charged and reactive groups, a dramatic increase in capacity (over 1000%) could be achieved, even at reduced [*20] concentrations of ligands. (D.I. 103 at 195-96) The activated hydrogel matrix employed in these experiments was attached to a silicon oxide surface via well-known silanization procedures. (D.I. 103 at 196-97) The resulting sensing element was suitable for use in a biosensor.

12 Previously, the Pharmacia researchers had avoided incorporating charged groups into the hydrogel matrix since it was well-known in the art of affinity chromatography that the presence of charged groups increases the incidence of nonspecific binding, a condition that was to be avoided in affinity-based systems. (D.I. 103 at 192)

D. The '161 Patent Application

19. **The PCT Application.** On November 9, 1989, three researchers from Pharmacia, Jan Bergstrom, Stefan Lofas, and Bo Johnsson, filed Patent Cooperation Treaty application PCT/SE89/00642 ("the PCT") entitled "Sensing Surfaces Capable of Selective Biomolecular Interactions. To Be Used in Biosensor Systems." (Joint Exhibit ("JX") 1) The application claimed priority from Swedish [*21] patent application 8804073 filed on November 10, 1988. (JX 1 at BIA 001545) The PCT was published on May 17, 1990. (JX 1 at BIA 001545)

20. The PCT is directed to

methods for the production, on metal surfaces, of surface layers which are capable of selective biomolecular interactions; sensing surfaces produced by means of these methods; and the use thereof in biosensors, especially in surface plasmon resonance systems.

(JX 1 at BIA 001545) The invention also discloses activated surfaces for coupling a desired ligand; surfaces containing bound ligand; and the use of such surfaces in biosensors.

(JX 1 at BIA 001547) The PCT teaches a barrier monolayer of an "organic molecule X-R-Y" between the

metallic surface of an SPR system and the desired ligands in order to bind the ligands and protect the metal surface. (JX 1) In addition, an optional embodiment discloses a matrix comprised of a hydrogel coupled to the X-R-Y monolayer by which ligands suitable for the target analytes can be immobilized. (JX 1 at BIA 001553-54) Although acknowledging that there exist methods for attaching a hydrogel directly to a surface, the specification of the PCT contends that [*22] these methods "have a number of obvious drawbacks;" it also recognizes that these "problems" can be "solved at least in part" by known procedures. (JX 1 at BIA 001549-50)

21. The PCT contains 14 claims. Claim 1 of the PCT is a generic claim drawn to a "sensing surface" for use in a [*432] biosensor. (JX 1 at BIA 001569) Claim 1 discloses a

sensing surface to be used in biosensors, characterized by consisting of a film of a free electron metal selected from the group consisting of copper, silver, aluminum and gold and having one of its faces coated with a densely packed monolayer of an organic molecule X-R-Y . . .

(JX 1 at BIA 001569) Claim 1 is the only independent claim; all the other claims, which are drawn to specific variations of the sensing surface described in claim 1, contain the limitations found in claim 1.

22. Claim 2 of the PCT discloses an optional embodiment:

A sensing surface according to claim 1, characterized by containing a biocompatible porous matrix which is bound to the monolayer X-R-Y and via which a desired ligand can be bound.

(JX 1 at BIA 001569) Claims 3-13, which are drawn to specific variations of the sensing surface described [*23] in claim 2, contain the limitations set forth in claim 2. ¹³

13 Claim 14 depends solely from claim 1, providing as follows:

A sensing surface according to claim 1, characterized by

containing a ligand which is bound to the monolayer X-R-Y.

(IX 1 at BIA 001571)

23. The U.S. Patent Applications. The '828 patent.

The same inventors who filed the PCT application filed the United States counterpart application, Serial No. 681,531, and a Preliminary Amendment with the PTO on May 10, 1991. (D.I. 96 at 2; PX 5) As with the PCT, the inventors claimed a priority filing date of November 10, 1988 based upon the Swedish patent application.

24. The claims of the U.S. counterpart patent initially were rejected, *inter alia*, as obvious over the prior art. In their response to the rejection, the applicants stated that

the basic concept of the present invention resides in providing a biosensor sensing surface, in the form of a free electron metal film, with a barrier layer comprising monomeric [*24] organic molecules which, through self-association, form a well-defined, dense and stable monolayer.

(PX 5) The applicants distinguished the prior art based on the presence in the invention of the barrier (i.e., the densely packed monolayer of organic monomeric molecules) alone or in combination with "a porous matrix":

No such barrier layer, nor its combination with a porous matrix such as a hydrogel, is disclosed or suggested by the cited references, either individually or in combination.

(PX 5) According to the applicants, the prior art references relied upon by the patent examiner disclose polymeric coatings. The applicants argued that the polymers of these coatings are either not as efficiently densely-packed as is the monolayer disclosed in the invention, thus providing less protection against corrosion and nonspecific binding, or are not bound to the surface in a manner so as to provide stability, uniformity, and durability. (PX 5) The applicants requested withdrawal of the rejection, concluding that

the cited prior art does not disclose or suggest a sensing surface comprising a metal film coated with a densely packed

monolayer of organic molecules [*25] X-R-Y as defined in claim 1, nor does it disclose or suggest such a barrier layer supporting a three-dimensional porous matrix, preferably a hydrogel, onto which ligands and analytes may be bound.

(PX 5)

25. On September 7, 1993, the U.S. counterpart application was issued as *U.S. Patent 5,242,828* (the "'828 patent"). (PX 4) The specification of the '828 patent is essentially the same as that of the PCT. The claimed invention relates to

[*433] the field of biosensors and is more specifically concerned with methods for providing metal surfaces with surface layers capable of selective biomolecular interactions. The invention also comprises activated surfaces for coupling a desired ligand; surfaces containing bound ligand and the use of such surfaces in biosensors.

(PX 4, col. 1, lns. 8-14; see also col. 8, lns. 16-21: "The invention relating to (i) the aforesaid methods for providing metal surfaces with surface layers capable of selective biomolecular interactions, to be used in biosensor systems . . .") The examples set forth in the specification of the '828 patent are drawn to SPR technology and demonstrate a hydrogel attached to a metal surface via an X-R-Y [*26] monolayer. (PX 4; D.I. 104 at 316) The specification does not describe a hydrogel attached to a nonmetal surface other than by reference to further patent applications. (D.I. 104 at 232, 316)

26. Whereas the PCT contains 14 claims, the '828 patent contains 27 claims. (PX 4) Besides claiming the sensing surface described and claimed in the PCT, the '828 patent also claims a "sensing element suitable for use in a biosensor" comprising a substrate, "a film of free electron metal . . . having a first and second major surface, said first major surface being in contact with the substrate," and "a densely packed monolayer of an organic molecule X-R-Y coated on said second major surface of said film." (PX 4, col. 14, lns. 38-63)

27. The sensing surface claimed and described in the '828 patent essentially is the same as that claimed in the

PCT. Claim 1 of the '828 *patent* discloses

1. A sensing surface suitable for use in a biosensor, comprising:

a film, having two faces, of a free electron metal selected from the group consisting of copper, silver, aluminum and gold; and

a densely packed monolayer of an organic molecule X-R-Y coated on one of the faces of said film where X is a [*27] group selected from the group consisting of

(PX 4, col. 13, Ins. 6-27) Whereas claims 2-16 of the '828 *patent* depend in part from claim 1, claims 17-21 depend solely from claim 1. ¹⁴

14 Independent claim 26 of the '828 *patent* also discloses a "sensing surface suitable for use in a biosensor." (PX 4, col. 15. In. 4) Said surface comprises

a film, having two faces, of a free electron metal selected from the group consisting of copper, silver, aluminum and gold; and a monolayer of an organic molecule X-R-Y coated on one of the faces of said film where X is a group selected from the group consisting of

(PX 4, col. 15, In. 6 - col. 16, In. 10) Claim 27 depends from claim 26 and provides as follows:

The sensing surface of claim 26, wherein said monolayer forms an efficient barrier layer which is stable upon storage and which protects said film from chemical corrosion.

(PX 4, col. 16, Ins. 11-14)

28. As in the PCT, claim 2 of the '828 *patent* describes an optional [*28] embodiment:

2. The sensing surface according to claim 1, which contains a biocompatible

porous matrix which is bound to the densely packed monolayer X-R-Y and via which a desired ligand can be bound.

(PX 4, col. 13, Ins. 28-31) Claims 3-16 are drawn to variations of the sensing surface disclosed in claim 2 and contain all the limitations found in claim 2.

29. **The '161 *patent*.** On May 10, 1993, the inventors of the '828 *patent* filed a continuation application, Serial No. 058,265 (the "'265 application") and a Preliminary Amendment. (PX 3) Claim 1, as set forth in the Preliminary Amendment, disclosed

[a] sensing surface suitable for use in a biosensor, comprising a hydrogel which is bound to a surface and via which a desired ligand can be bound, which hydrogel is activated to contain (i) charged [*434] groups for bringing about a concentration of biomolecules carrying an opposite charge to that of said charged groups, and (ii) reactive groups for covalently binding said biomolecules concentrated to said sensing surface.

(PX 3 at 68) In contrast to the claims of the '828 *patent*, the claims of the '265 application did not recite a densely packed monolayer [*29] of organic monomeric molecules forming a barrier on a metal surface.

30. On November 8, 1993, during the prosecution of the '265 application, the claims were rejected by the patent examiner for obviousness-type double patenting over the '828 *patent*. (PX 3, Tab 6) In response to this rejection, on April 20, 1994, the inventors filed a terminal disclaimer, disclaiming the '265 application beyond the expiration date of the '828 *patent*. (PX 3, Tab 8)

31. The claims were also rejected as obvious in light of the prior art, specifically European Patent Application Publication No. 0 226 470 (the "'470 patent") in combination with other prior art references. (PX 3, Tab 6) In this regard, the patent examiner opined that the prior art already disclosed the use of an activated hydrogel on a surface and that such "an 'activated' hydrogel would inherently provide for the claimed features of charged and reactive groups." (PX 3, Tab 6 at BIA 000116) In response to this rejection, the applicants distinguished the prior art, individually and in combination, asserting that

none of the cited references (1) discloses or suggests the concept of combining charged and reactive groups; (2) contains [**30] any example where the hydrogel has been provided with both charged and reactive groups; or (3) discloses or suggests that an activated hydrogel would have a concentrating effect on biomolecules.

(PX 3, Tab 7 at BIA 000153)

32. Although the claims of the '265 application ultimately were allowed, the application subsequently was abandoned, and on July 22, 1994, the inventors filed another continuation application, Serial No. 279,089. (PX 3, Tabs 11, 12, and 13) The claims of this application were initially rejected by the patent examiner, inter alia, "as being indefinite for failing to particularly point and distinctly claim the subject matter which applicant regards as the invention." (PX 3, Tab 15 at BIA 000333) The examiner noted, however, that the subject matter of the application was allowable:

The prior art discloses the use of charged species to concentrate biomolecules to an area and the use of charged species to improve binding capabilities, however fails to disclose the use of a hydrogel, bound to a substrate, that has charged groups for concentrating biomolecules and uncharged groups ("reactive groups") for binding an analyte.

(PX 3, Tab 15 at [**31] BIA 000334) Following revision of the application in accordance with the examiner's comments, this application issued as the '161 patent on July 25, 1995. ¹⁵ (PX 3, Tab 17)

15 On February 4, 1998, Biacore filed a terminal disclaimer in the PTO disclaiming the '161 patent beyond the expiration date of the '828 patent. (DX 578) The PTO granted the disclaimer on September 8, 1998. (PX 431)

E. The '161 Patent

33. **The abstract and specification.** The abstract describes the invention claimed in the '161 patent as follows:

A matrix coating suitable for use in a biosensor is provided. This matrix coating comprises a hydrogel bound to a surface and via which a desired ligand can be bound. This hydrogel is activated to contain charged groups for bringing about the concentration of biomolecules carrying an opposite charge to that of said charged groups, and reactive groups for covalently binding the biomolecules concentrated to the matrix coating.

(PX 1, Abstract)

34. The specification of [**32] the '161 patent, which is essentially the same as that of [**435] the '828 patent, includes the following field of the invention:

The present invention relates to the field of biosensors and is more specifically concerned with methods for providing metal surfaces with surface layers capable of selective biomolecular interactions. The present invention also comprises activated surfaces for coupling a desired ligand; surfaces containing bound ligand; and the use of such surfaces in biosensors.

(PX 1, col. 1, lns. 15-21) The invention claimed is described as

[a] generally useful sensing surface for biosensor systems, especially SPR, . . . fulfilling the following desiderata:

. . . Chemically resistant to the media employed.

. . . Compatible with proteins and other biomolecules and . . . not interacting with any molecules other than those desired.

. . . Capable of providing for covalent binding of such a large number of ligands as is required for a general applicability of this technique to a variety of analytical problems.

. . . Providing a tridimensional matrix for the sample solution for binding the

target molecules therein. In this manner a greater part of the volume [*33] influencing the resonance effect, by way of its refractive index, will be utilized as compared to cases where a two-dimensional surface would be used.

(PX 1, col. 3, lns. 19-39)

35. The specification indicates that the scope of applicability of the claimed invention extends beyond the field of biosensor technology. Specifically, it is noted that

. further scope of the applicability of the present invention will become apparent from the detailed description and drawings provided [therein]. (col. 3, lns. 43-45)

. this type of surface modification can be utilized also in other fields of technology where a specific, or alternatively, a low non-specific, interaction is required between a surface on one hand and proteins or other biomolecules on the other hand. Examples that may be mentioned are parts of chromatographic systems for biomolecule separations It would also be possible to construct capillary-type chromatographic columns in conformity with these principles. Furthermore, it is evident that a surface structure may be modified so as to acquire biocompatibility, for use in environments of the "in vivo" type. Depending on the particular field of use contemplated, [*34] the actual choice of, for example, the hydrogel, can be made such that undesired interactions are minimized. To those skilled in the art, a number of additional fields of use will be readily obvious, along the lines of the aforesaid examples. (col. 6, lns. 20-38)

. it will be readily evident that ion exchanging groups, metal chelating groups and various types of receptors for biological molecules--such as are known from conventional liquid chromatographic procedures--may be employed for the construction of systems which are suitable

for selection purposes even in complex measuring systems. (col. 7, lns. 40-48)

36. **The claims.** The '161 patent contains 15 claims. Claim 1 is a generic claim, drawn to a "matrix coating suitable for use in a biosensor." Claims 2-4 are drawn specifically to particular modifications of the matrix described in claim 1. Claim 15 is drawn to a "sensing element suitable for use in a biosensor." Claims 1 and 15 are the only independent claims; claims 2-14 depend, at least in part, on claim 1. Biacore alleges that Thermo has infringed claims 4 and 5 of the '161 patent. Thermo seeks a declaratory judgment of invalidity with respect to claims 1-5, 9-11, and [*35] 15.

37. Claim 1 reads:

[*436]

1. A matrix coating suitable for use in a biosensor, comprising a hydrogel which is bound to a surface and via which a desired ligand can be bound, which hydrogel is activated to contain (i) charged groups for bringing about a concentration of biomolecules carrying an opposite charge to that of said charged groups, and (ii) reactive groups for covalently binding said biomolecules concentrated to said matrix coating.

(PX 1, col. 12, ln. 63 - col. 13, ln. 2)

38. Claim 1 is directed to a matrix coating "suitable for use in a biosensor." As defined in the patent, a biosensor is

a unique combination of a receptor for molecular recognition, for example a selective layer with immobilized antibodies, and a transducer for transmitting the interaction information to processable signals.

(PX 1, col. 1, lns. 23-27) This broad definition comports with the definitions found in the literature relevant to biosensor technology.

39. The disclosed matrix coating is further described as comprising a "hydrogel which is bound to the surface."

The patent defines hydrogel by reference to Merrill et al., *Hydrogels for Blood Contact* (1986). (PX 1, [*336] col. 5, lns. 49-52) According to Merrill, a hydrogel

presents a surface layer of bound molecules which by reason of their chemical nature hold a large fraction of water, in which the molecules are predominantly in an amorphous, water-solvated state, and in which the thickness of the layer is of the order of 30 A minimum up to any indefinitely higher limit.

(JX 3 at 2; PX 1, col. 5, lns. 49-52; D.I. 103 at 199; D.I. 106 760-61) Dr. William H. Scoulen, Thermo's expert witness, opined that this definition "does not differ substantially from what a person of ordinary skill in the art would understand the plain meaning of the word 'hydrogel'" to be. (D.I. 107 at 858-59) The means by which the hydrogel is bound to the surface is not limited in the patent to any specific binding chemistry; thus, any form of contact, covalent, physical, or adhesive, is sufficient. (D.I. 104 at 231-32, 294; D.I. 107 at 859-60) Nor is the type of surface to which the hydrogel is bound limited despite the fact that the examples set forth in the specification refer only to metallic surfaces.¹⁶ (D.I. 103 at 205-07; D.I. 104 at 246-47, 251-52, 287-92; D.I. 106 at 766; D.I. 107 at 858)

¹⁶ Prior to trial, Thermo asserted that the claims should be limited to metal surfaces. Thermo appears, however, to have abandoned this position.

[**37] 40. The hydrogel disclosed in claim 1 must be able to bind the desired ligands. (see also PX 1, col. 1, lns. 48-49: "[A] sensing surface composed of . . . 'ligands.'") According to the patent, ligands, or receptors, are "molecules or molecular structures which interact selectively with one or more biomolecules." (PX 1, col. 1, lns. 48-51) Within the context of claim 1, ligand is used in the same manner as that term is employed in the field of affinity chromatography. (D.I. 107 at 863) The patent does not specifically limit the means by which the ligands are bound to the hydrogel. (D.I. 104 at 253-54)

41. Said hydrogel is "activated to contain" two types of chemical groups. These groups are defined by their function. (D.I. 104 at 235) Specifically, the groups are:

(1) charged groups for concentrating oppositely-charged biomolecules and (2) reactive groups for covalently binding the concentrated biomolecules. (PX 1, col. 12, lns. 66 - col. 13, ln. 2) The patent does not specify the degree or amount of charge required with respect to the charged groups or the degree of ligand concentration required by the reactive groups. (D.I. 106 at 780, 791) Nor does the patent state the relative [*38] ratio of the two chemical groups or the chemical nature of the groups, except as that is limited by the function to be performed. (D.I. 104 at 234-35) In fact, the patent allows for the [*437] two groups to be one and the same, i.e., the same chemical group on the hydrogel could serve both functions. (D.I. 104 at 234; D.I. 106 at 777) No mention is made in the patent as to the process whereby the charged and reactive groups are put onto the hydrogel. (D.I. 104 at 244-45)

42. Dependent claims 2-5 and 9-11 provide as follows:

2. The matrix coating according to claim 1, wherein said hydrogel is a polysaccharide or a swellable organic polymer.

3. The matrix coating according to claim 2, wherein said hydrogel is a polysaccharide selected from the group consisting of agarose, dextran, carrageenan, alginic acid, starch, and cellulose, and a derivative of any of the foregoing.

4. The matrix coating according to claim 3, wherein said hydrogel consists of dextran.

5. The matrix coating according to claim 4, wherein said charged groups and said reactive groups of said dextran are carboxyl groups, part of which are in the form of reactive esters, hydrazides, thiols, or reactive [*39] disulfide-containing derivatives.

9. The matrix coating according to claim 2, wherein said charged groups and said reactive groups of said hydrogel are carboxyl groups, part of which are in the

form of reactive esters, hydrazides, thiols, or reactive disulfide-containing derivatives.

10. The matrix coating according to claim 1, wherein said charged groups and said reactive groups of said hydrogel are selected from the group consisting of hydroxyl groups, carboxyl groups, amino groups, aldehyde groups, carbonyl groups, epoxy groups, and vinyl groups for immobilizing a desired ligand, and, optionally, a biospecific ligand bound via said groups.

11. The matrix coating according to claim 1, wherein said charged groups are carboxyl groups.

(PX 1, col. 13, lns. 3-19; col. 13, ln. 31 - col. 14, ln. 11)

43. Independent claim 15 is drawn to "[a] sensing element for use in a biosensor," said sensing element comprising:

a substrate; and

a matrix coating comprising a hydrogel supported on said substrate via which a desired ligand can be bound, which hydrogel has been activated to contain (i) charged groups for bringing about a concentration of biomolecules [*40] carrying an opposite charge to that of said charged groups, and (ii) reactive groups for covalently binding said biomolecules concentrated on said matrix coating.

(PX 1, col. 14, lns. 23-32) The patent does not limit the term "sensing element" to any particular type or types of element capable of detecting an analyte. In addition, the patent does not specifically limit the type of surface to be employed or the means for supporting the hydrogel on the substrate.

F. The Prior Art

44. The publications characterized by Thermo as prior art include: (1) the '470 patent published June 24, 1987; (2) an article entitled Polysaccharide Derivatives as

Coats for Nylon Tube Urease authored by Francis N. Onyeji and Akintunde C. Onitiri and published in *Analytical Biochemistry*, Vol. 117, in 1981 (the "Onyeji reference"); (3) an article authored by Carl Fredrik Mandenius et al. entitled Reversible and Specific Interaction of Dehydrogenases with a Coenzyme-Coated Surface Continuously Monitored with a Reflectometer that was published in *Analytical Biochemistry*, Vol. 157, in 1986 (the "Mandenius reference"); (4) a paper authored by Dr. Scouten et al. entitled Immobilizing [*41] Fluorescently-Labeled Albumin for Use in a Fiberoptic Bilirubin [*438] Monitor that was presented at the Chemically Modified Surfaces symposium in June 1987 (the "Scouten paper"); (5) a survey article authored by Dr. Scouten entitled A Survey of Enzyme Coupling Techniques that was published in Vol. 135 of *Methods in Enzymology, Immobilized Enzymes and Cells Part B* in 1987 (the "Scouten survey article"); (6) an article entitled Simple Hydrazidation Method for Carboxymethyl Groups on Cross-Linked Dextran authored by Hiroshi Akanuma and Makoto Yamasaki and published in the *Journal of Biochemistry*, Vol. 84, in 1984 (the "Akanuma reference"); (7) an article authored by Russell G. Frost et al. entitled Covalent Immobilization of Proteins to N-Hydroxysuccinimide Ester Derivatives of Agarose—Effect of Protein Charge on Immobilization that was published in *Biochimica et Biophysica Acta*, Vol. 670, in 1981 (the "Frost reference"); (8) an article authored by Suresh B. Shukla entitled Preparation of an Active Ester Agarose Derivative Having a Positively Charged Spacer Arm: Enhanced Coupling to Acidic Proteins that was published in *Affinity Chromatography and Biological* [*442] Recognition in 1983 (the "Shukla reference"); (9) an article entitled Covalent Immobilization of Enzymes on Ionogenic Carriers authored by V.P. Torchilin et al. and published in the *Journal of Solid-Phase Biochemistry*, Vol. 2, in 1977 (the "Torchilin reference"); (10) *U.S. Patent No. 3,619,371* entitled "Production of a Polymeric Matrix Having a Biologically Active Substance Bound Thereon" issued on November 9, 1971 with a priority date of July 3, 1967 (the "Crook patent"); and (11) a 1986 brochure for Activated Affinity Supports Affi-Gel 10 and 15 by Bio-Rad Laboratories (the "Bio-Rad brochure"). All of these references are within the field of ligand immobilization. It is undisputed that these references were publicly available more than one year prior to the priority date at issue and, thus, constitute prior art. Thermo contends that four of these references, the '470 patent, the Onyeji article, the Mandenius reference, and

the Scouten paper, each standing alone, anticipate the asserted claims of the '161 patent with the exception of claim 5. Alternatively, Thermo contends that the claimed invention is obvious in light of the identified prior art.

45. **The teachings [**43] of the '470 patent.** ¹⁷ The '470 patent discloses a microchemical analytic apparatus comprising a solid substrate having a surface that carries a hydrogel formed thereon and covalently bound thereto. (DX 541) The patent considers the invention's use in an electrochemical biosensor as well as its suitability for use in other types of biosensors, such as thermistors and optical biosensors. (DX 541 at Col. 3, ln. 55 - col. 4, ln. 3; col. 7, lns. 2-20; D.I. 107 at 813)

17 A copy of the '470 patent was provided to the PTO by the patentees during the prosecution of the '161 patent. Initially, the examiner rejected claims 15-27 of the application over the '470 patent, stating that "it is believed that an 'activated' hydrogel would inherently provide for the claimed features of charged and reactive groups." (PX 2, Paper No. 6 at 6) Thermo contends that Biacore's predecessor in response to this rejection misrepresented the teaching of the '470 patent when it stated "none of the cited references . . . (2) contains any example where the hydrogel has been provided with both charged and reactive groups." (PX 2, Paper No. 7 at 16)

[**44] 46. Example 5 of the '490 patent describes a method for preparing a matrix coating comprising an acrylic hydrogel bound to a glass slide. According to the patent,

the carboxyl groups contained within the polymer matrix may be activated by treatment with, for example, an aqueous solution Woodward's Reagent K The activated copolymer may then be reacted with functional groups such as antibody protein molecules, antigens, or haptens.

(DX 541, col. 8, lns. 43-49) According to Dr. Scouten, the Woodward's Reagent K, which possesses an overall neutral charge with a positive amine and a negative sulfate [**439] group, reacts with the carboxyl groups on the polymer to form a "charged and activated reactive ester." (D.I. 106 at 792) Thus, the activated hydrogel disclosed in example 5 of the '470 patent contains

charged groups, the Woodward's Reagent K sulfate groups as well as any of the original carboxyl groups that did not react, and reactive groups, the reactive esters, that "happen to be the same thing." (D.I. 106 at 793; D.I. 107 at 816-17)

47. The surface described in example 5 was never placed in a biosensor. (D.I. 107 at 934) Dr. Anthony P.F. Turner, Biacore's expert [**45] witness, testified that, although one skilled in the art would know that under certain conditions the matrix disclosed in example 5 might contain charged groups that would attract oppositely-charged biomolecules, the resulting concentration, if any, would be insufficient to produce a useful signal. (D.I. 104 at 306-07) According to Dr. Turner, the concentration of ligands necessary to produce a useful signal would vary depending on a number of factors, including the use of the biosensor and the activity of the biological receptor being used. (D.I. 104 at 307)

48. With respect to claims 1 and 15, the '470 patent does teach a hydrogel that is both bound to a surface and activated to contain charged and reactive groups. Relevant to claims 9-11, the charged and reactive groups disclosed are carboxyl groups, some of which are in the form of reactive esters. The '470 patent, however, does not teach the use of charged groups for concentrating oppositely-charged biomolecules. Nor does the '470 patent teach that the ionic concentration should be such that electrostatic concentration can be achieved. ¹⁸ (D.I. 104 at 256-57, 305; D.I. 107 at 928-29)

18 In an ex parte experiment, Dr. Scouten "replicated" example 5 of the '470 patent. (D.I. 107 at 818-23; DX 574 at 16-18) His results indicated that the hydrogel disclosed in example 5, in fact, did contain charged groups capable of bringing about, and actually brought about, a concentration of oppositely-charged biomolecules and reactive groups capable of covalently binding the concentrated biomolecules. (D.I. 107 at 818-22; DX 574) However, Dr. Scouten chose the conditions under which to conduct the experiment since they are not set forth in the patent itself. Thus, the results of his experiment are of little probative value since it cannot be ascertained with any certainty whether Dr. Scouten created the same polymer disclosed in example 5. Moreover, Dr. Scouten never placed the surface he created in a biosensor to determine its functionality.

[**46] 49. With respect to claim 2, the '470 patent teaches the use of a hydrogel that is a swellable organic polymer. (D.I. 107 at 817) With respect to claims 3-4, the '470 patent does not teach the use of a polysaccharide, or more specifically, the use of dextran. (D.I. 107 at 816-17)

50. **The teachings of the Onyezili reference.** The Onyezili reference addresses the immobilization of the enzyme urease inside nylon tubes, a procedure used in medical biochemistry. (DX 533) More particularly, the reference teaches the use of polysaccharide derivatives, specifically a dextran derivative, in order to provide a more hydrophilic coat inside the nylon tubes and to eliminate the nonspecific binding of urease to the tubes. (DX 533 at 121) In the experiment, amino "arms" or "coats" were incorporated into an alkylated nylon tube by filling the tube with the polyamine derivative of dialdehyde dextran ("DPA"). ¹⁹ (DX 533 at 121-23) The tube was activated by filling it with glutaraldehyde [*440] in a borate buffer. (DX 533 at 121-23) Subsequently, the tube was filled with a solution of urease, an enzyme that converts urea into ammonia. (DX 533 at 121-23) The activity of the immobilized urease was determined [*447] by measuring the enzyme-catalyzed hydrolysis of urea in EDTA buffer, i.e., by assaying the effluent for ammonia. (DX 533 at 121-23)

19 The polyamine derivative of dialdehyde dextran was prepared in part by subjecting dialdehyde dextran to periodate oxidation. (DX 533 at 121) According to Biacore, Thermo's own researchers had abandoned this method, finding that there was no significant difference in ligand binding between the oxidized dextran and the bare biosensor surface. (D.I. 114 at 28; PX 65 at 109239) The Thermo researchers theorized that this was due to periodate breakdown of the glycosidic bonds in the dextran. (PX 65 at 109239) In making this argument, however, Biacore relies on a technical document that was not discussed with any witness at trial. Therefore, the court is unable to determine the weight to be afforded Biacore's argument.

51. With respect to claims 1 and 15, the Onyezili reference teaches a dextran matrix covalently bound to a nylon surface. Said matrix is activated to contain reactive [*448] groups (the carbonyl and aldehyde groups of glutaraldehyde). (D.I. 107 at 824-26) According to Dr.

Scouten, the matrix also contains charged groups, the amines of the amino DPA "arms" or "coats" that are incorporated into the tube. (D.I. 107 at 927) Dr. Scouten indicated that these groups, although they interact with the glutaraldehyde, retain their positive charge even in the presence of excess glutaraldehyde. (D.I. 107 at 823-24) The reference itself, however, states that

more significantly, O-alkylated nylon tubes modified with DPA bound virtually no urease without activation with glutaraldehyde. This observation would suggest that, in these tubes, urease would not be immobilized by nonspecific bonds but would be bound by the covalent linkages between the carbonyl groups (from glutaraldehyde) on the tube and amino groups in the enzyme.

(DX 533 at 124) Dr. Scouten felt that this statement applied "after a washing procedure necessary for use of the material," although there is no indication of such in the reference. (D.I. 107 at 926) Therefore, according to Dr. Scouten, the statement does not suggest that there was no concentration by charge of the urease prior to [*449] activation by glutaraldehyde. (D.I. 107 at 926) He conceded, however, that nothing in the reference indicated that concentration by charge occurred. (D.I. 107 at 926)

52. Dr. Scouten also conceded, assuming arguing the presence of charged groups, that the reference does not disclose explicitly the use of charged groups for bringing about a concentration of oppositely-charged biomolecules. (D.I. 107 at 923) He also admitted that, if what is required first is concentration of biomolecules by charged groups, then the reference also does not teach reactive groups that function to covalently bind biomolecules having been so concentrated. (D.I. 107 at 923-24) He testified, however, that the reference does report reactive groups for covalently binding biomolecules. (D.I. 107 at 924)

53. Dr. Scouten also admitted that the Onyezili reference does not disclose a biosensor as that term is defined in the '161 patent. (D.I. 107 at 922-23) Accordingly, he conceded that the reference does not teach the use of a matrix in a biosensor. (D.I. 107 at 922-23) The reference does not describe the element used to monitor the binding event. (D.I. 107 at 922-23)

Specifically, the article does not indicate [*50] whether the method for detecting ammonia in the effluent involved manual assay or the use of a transducer. (D.I. 107 at 922-23) According to Dr. Scouten, had the reference described employment of the latter, then it would have disclosed the use of a biosensor as defined in the '161 patent. (D.I. 107 at 922-23) It was Dr. Scouten's opinion, however, that the surface disclosed in the Onyali reference is suitable for use in a variety of types of biosensors. (D.I. 107 at 823)

54. With respect to claims 2-4, the reference teaches the use of a polysaccharide hydrogel, specifically dextran. With respect to claim 10, the reference discloses a matrix coating wherein the charged groups are amines and the reactive groups are carbonyl and aldehyde groups.

55. **The teachings of the Mandenius reference.** The Mandenius reference reports the findings of an affinity-based study in which the reversible affinity binding [*441] of NAD²⁰ dependent dehydrogenase to an NAD-coated silicon surface was monitored using a reflectometer. (DX 530) As part of the experiment, after silanization, silicon chips were coated with a layer of T500²¹ dextran in order to "bypass" possible nonspecific binding. (DX 530 [*51] at 283-85; D.I. 107 at 906-08) The hydroxyl groups of the dextran were activated using tressyl chloride after which NAD analogs were covalently fixed to the surface and the time course of affinity binding measured.²² (DX 530 at 283-85)

20 NAD stands for nicotinamide adenine dinucleotide. Dictionary of Biochemistry 317.

21 While the "T" refers to "technical grade," the number refers to the molecular weight of the dextran, in this case 500,000 daltons.

22 Biacore researchers determined through their own experiments that dextran modified with tressyl chloride was unsuitable for use in a biosensor. (D.I. 103 at 194) Thermo researchers, conducting their own experiments, reached this same conclusion. Dr. Scouten, however, questioned the technique employed by Dr. Robert Davies, the head of Thermo's biosensor surface development program, in carrying out the tressyl chloride experiments. (D.I. 107 at 903-05) According to Dr. Scouten, Dr. Davies deviated from the teachings of the published article he was following when he conducted the experiments.

(D.I. 107 at 903-05) Dr. Davies' conduct caused Dr. Scouten to question whether Dr. Davies was a person of ordinary skill in the art, despite the fact that Thermo considered him its most experienced scientist with regard to ligand immobilization. (D.I. 107 at 903)

[*52] 56. With respect to claims 1, 11, and 15, the reference teaches the use in a biosensor (reflectometer) of a dextran matrix coating bound to a silicon surface. (D.I. 107 at 827-30) The hydrogel is activated to contain reactive groups in the form of tressyl groups, tressyl being a kind of sulfonyl ester which acts like "a sticky molecular gluing agent." (D.I. 107 at 827-30) With regard to the presence of charged groups, Dr. Scouten opined that dextran possesses an inherent negative charge due to the presence of carboxyl groups in the polysaccharide. (D.I. 107 at 827-30; see discussion *infra* at Part II.G) It is undisputed that activation of the dextran with tressyl chloride would not result in the incorporation within the hydrogel of charged carboxyl groups.

57. The reference does not disclose explicitly the use of a matrix carrying a charge. (D.I. 107 at 911) Accordingly, it does not teach the use of charged groups for concentrating oppositely-charged biomolecules. (D.I. 107 at 918-19) In fact, dextran was selected in order to avoid nonspecific binding:

To bypass possible nonspecific binding we decided first to coat the silicon chip used with dextran as this has previously [*53] been shown to allow fibrinogen to be desorbed conveniently from a silicon surface by buffer solutions which otherwise would not have been possible . . .

(DX 530 at 283) Nor does the Mandenius reference teach that the alleged inherent charge of the dextran matrix, or the incorporation of charged groups in a dextran matrix, will be beneficial in bringing about a concentration of oppositely-charged biomolecules. (D.I. 107 at 911-12, 918-19) Dr. Scouten averred, however, that one of ordinary skill in the art would know that inherent in dextran are charged carboxyl groups. (D.I. 107 at 911) He further opined that one of ordinary skill would have recognized that charged groups would be advantageous because they would facilitate concentration of the enzyme into the gel. (D.I. 107 at 910) Dr. Scouten

pointed to the fact that in the reference the dextran-coated chips were activated by tressyl chloride dissolved in pyridine, a base. (D.I. 107 at 913-14) According to Dr. Scouten, under those conditions, the carboxyl groups inherently present in the dextran would have been negatively charged. (D.I. 107 at 913-14)

58. The structure disclosed in the Mandenius reference that Dr. Scouten [*54] contended met the conditions of claim 1 was not used in a biosensor. Instead, that structure was further treated with a relatively high concentration of NAD in a sodium [*442] phosphate buffer (0.1 M, pH 7.5, no longer basic conditions) in order to effect ligand immobilization before its use in a biosensor. (D.I. 107 at 914, 917-18) According to Dr. Scouten, "those conditions may or may not cause concentration of the NAD," which still would have been positively charged at that pH. (D.I. 107 at 915, 917-18) Dr. Scouten opined, although he had "not looked up the binding of NAD," that

there are conditions [under which] this material that Mandenius describes would be very useful in making a biosensor and that the actual use of that would both have the charged groups concentrating the biomolecules and the reactive groups binding to the biomolecules that were concentrated.

(D.I. 107 at 918)

59. With respect to claims 2-4, the hydrogel taught in the reference is dextran, a polysaccharide. (D.I. 107 at 830)

60. **The teachings of the Scouten paper.** The Scouten paper teaches methods for immobilizing fluorescent-labeled bovine serum albumin ("BSA") on cellulose membranes. (DX [*55] 524) These membranes are incorporated into a fiber optic probe used to monitor bilirubin concentrations directly in the bloodstream. (DX 524) One method taught in the paper involves treating dialysis membranes ²³ with polyethylenimine and then reacting those membranes with a glutaraldehyde solution. (DX 524 at 120-21) Fluorescent-labeled BSA then is added to the membranes and allowed to react. (DX 524 at 120-21)

23 Dialysis membranes are comprised of cellulose that has been dissolved until it becomes

amorphous and then reprecipitated into a particular form. (D.I. 107 at 832-34)

61. With respect to claims 1 and 15, the Scouten paper teaches the use in a fiber optic biosensor of a polyethylenimine hydrogel bound to a dialysis membrane. The hydrogel is activated to contain reactive groups in the form of aldehyde and vinyl groups of glutaraldehyde. (D.I. 107 at 832-34) According to Dr. Scouten, the hydrogel also has incorporated into it positively-charged amine groups—these groups being part of the polyethylenimine's [*56] backbone. (D.I. 107 at 832-34, 939-40)

62. Dr. Scouten conceded that this paper does not disclose charged groups that are functioning to bring about a concentration of biomolecules carrying an opposite charge. (D.I. 107 at 939-40) He also admitted that the article does not teach that one should employ conditions that would allow the charged groups to electrostatically attract biomolecules into the matrix. (D.I. 107 at 939-40) In fact, the conditions under which Dr. Scouten employed the structure are not set forth in the reference except to state the use of a phosphate buffer, the pH of which is unspecified. (D.I. 107 at 941-43) Dr. Scouten never performed any tests to determine whether or not electrostatic concentration occurred under the experimental conditions he employed in developing the disclosed procedure. (D.I. 107 at 943)

63. With respect to claims 2-4, polyethylenimine is a swellable organic polymer, but it is not dextran. With respect to claim 10, the disclosed matrix coating is activated to contain charged groups that are amines and reactive groups that are aldehyde and vinyl groups.

64. Dr. Scouten opined generally that it would have been apparent to one of skill in [*57] the art possessing knowledge of organic chemistry that incorporated in the matrix coatings disclosed in the aforementioned references are charged groups that would act, under the proper conditions, to attract and concentrate ligands. (D.I. 107 at 835-36) Moreover, Dr. Scouten opined that one of ordinary skill in the art would have known from, for example, ion exchange chromatography literature, of the conditions, i.e., the pH, necessary to take advantage of the charged groups to concentrate the desired biomolecules prior to covalent binding. (D.I. 106 at 781; D.I. 107 at 964)

[*443] 65. **The teachings of the Scouten survey**

article. The 1987 Scoulen survey article lists a number of methods for covalently coupling enzymes to a variety of matrices. (DX 518 at 38-41) Specifically, the article mentions the use of carbodiimide as a coupling agent with, inter alia, agarose and cellulose matrices. (DX 518 at 38-41) In addition, it discloses a number of activation reagents that are used for hydrogels, including hydrazine and *N*-hydroxysuccinimide ("NHS"), both of which can be employed to provide negatively charged groups on a carboxymethyl ("CM")-dextran hydrogel matrix. (DX 518 at 54-55)

[**58] **66. The teachings of the Akanuma reference.** The Akanuma reference discloses in the context of affinity chromatography a method for the conversion of CM-Sephadex (cross-linked dextran) into its hydrazide derivative. (DX 519) Specifically, the reference discloses a procedure whereby CM-Sephadex is treated with a carbodiimide, resulting in the formation of ester linkages, i.e., the formation of lactone rings on the dextran derivative. (DX 519 at 1358-60) The resultant beads are treated with hydrazine to form hydrazinocarbonylmethyl-Sephadex, a hydrazide derivative of CM-Sephadex. (DX 519 at 1358, 1360-61) Analysis of the product so formed revealed that more than 90% of the carboxyl groups were converted to hydrazide groups. (DX 519 at 1360) The reference "proposes" the use of this procedure "as a general and effective method for the conversion of carboxymethylpolysaccharides into their hydrazide derivatives." (DX 519 at 1360-61)

67. With respect to claim 5, the Akanuma reference teaches the use of activation reagents to produce an activated dextran hydrogel matrix having carboxyl groups at least 90% of which are in the form of reactive hydrazides.

68. The "Charged Concentration" [59] References.** ²⁴ The remaining prior art references, the "Charged Concentration References," are indicative of the knowledge as of November 1988 of the concept of charged attraction, i.e., Coulomb's Law. ²⁵ (D.I. 107 at 836) In general, these references teach the combined use of charged and reactive groups in order to enhance ligand immobilization.

²⁴ In their post trial brief on the issue of invalidity, Thermo cites to seven (7) prior art references that it refers to collectively as the "Charged Concentration References." Dr. Scoulen

addressed only five of these references at trial. The court, therefore, will limit its analysis to those five references.

²⁵ Coulomb's law is an expression for the electrostatic force between two point charges; the force is repulsive if the charges have the same sign and attractive if the charges have the opposite sign. See Dictionary of Biochemistry 104.

69. The teachings of the Frost reference. The Frost reference addresses, in the context of affinity chromatography, [**60] the effect of protein charge on immobilization. (DX 527) Specifically, the experiments described were conducted to determine the optimal conditions for immobilization of acidic, neutral, and basic proteins to a matrix coating, said matrix coating being either an uncharged (Affi-Gel 10) or a positively charged (Affi-Gel 15) NHS ester derivative of agarose. (DX 527 at 163-64) The results of the study indicate "that an important factor which determines the level of immobilization of a given protein using active ester gels is the net charge on the protein relative to the net charge on the . . . [matrix], at the specific pH used for immobilization." (DX 527 at 167)

70. The teachings of the Shukla reference. The Shukla reference compares the immobilization of acidic proteins for an NHS ester derivative of cross-linked agarose beads containing a positively charged spacer arm with that for an NHS-activated gel with an uncharged spacer arm. (DX 528) The results of the study show that the amount of protein immobilized to the positively-charged agarose was "appreciably higher" than the amount bound to the gel [**444] with the uncharged spacer. (DX 528 at 296) The reference attributes this difference [**61] in coupling efficiency "to interaction between the positively charged, protonated tertiary amine of the spacer arm and the net negative charge of the proteins, buffered at a pH above their isoelectric points." (DX 528 at 296)

71. The teachings of the Torchilin reference. The Torchilin reference examines the effect of electrostatic complex formation on enzyme immobilization using ionogenic carriers. (DX 531) The results of the study indicate that electrostatic complex formation between an ionogenic carrier and a ligand prior to immobilization increases the amount of immobilized enzyme. (DX 531 at 22) Furthermore, the results demonstrate "that for successful complex formation some minimal number of

charged groups in the carrier should exist. Under this limit the complex formation does not take place . . ." even under favorable conditions. (DX 531 at 24) The reference concludes by suggesting that "in immobilization of enzymes and other biologically active compounds on ionogenic carriers by covalent binding, electrostatic complex formation between the protein and the carrier can be successfully used. This allows the binding of larger amounts of active enzyme and a significant increase [*62] in the stability of the products." (DX 531 at 27)

72. The teachings of the Crook patent. The Crook patent discloses a "polymeric matrix having a biologically active substance chemically bound thereto, which comprises a polymer and a biologically active substance . . . linked by" a triacin compound. (DX 540, col. 6, lns. 27-42) The patent further discloses a process for producing said polymeric matrix wherein the biologically active substance is one of a particular set of enzymes and the triacin compound has attached thereto a nucleophilic substituent that is an amino acid,

preferably one that carries a positive charge when in contact with solutions having a pH in the normal biological range, that is to say the range within which biological reactions will proceed Groups that are electrically neutral or that carry a negative charge can be used in some circumstances, but it has been found that the presence of such a positive charge frequently assists the reaction of a biologically active substance with the polymer.

(DX 540, col. 7, ln. 7 - col. 8, ln. 4; col. 1, lns. 59-68) The patent indicates that polymers suitable for use in forming the matrix include [*63] cellulose, cross-linked dextran (e.g., Sephadex by Pharmacia of Uppsala, Sweden), starch, and dextran. (DX 540, col. 6, lns. 64-65; col. 2, lns. 68-73) The specification cites as potential uses of the disclosed polymeric matrices "luciferase systems for A.T.P. estimation, biochemical fuel-cells," and "enzymatic analysis, particularly in the sequential analysis of proteins, R.N.A. and D.N.A." (DX 540, col. 3, lns. 51-58) All of these uses, according to Dr. Scouten, are "for or in a biosensor." (D.I. 106 at 779)

73. The teachings of the Bio-Rad Bulletin. The

Bio-Rad bulletin attributes the difference in coupling efficiency of the Affi-Gel 10 and Affi-Gel 15 supports

to interaction between the charge on the protein and charge on the gel. Hydrolysis of some of the active esters during aqueous coupling will impart a slight negative charge to Affi-Gel 10. This negative charge will attract positively charged proteins (proteins buffered at a pH below their isoelectric point) and enhance their coupling efficiency. Conversely, the negative charge will repel negatively charged proteins (proteins buffered at a pH above their isoelectric point) and lower their coupling efficiency. [*64] Affi-Gel 15, due to the tertiary amine incorporated into its arm, has a slight overall positive charge, and the effects are reversed.

(DX 951 at 2) The bulletin dictates the conditions, e.g., isoelectric point and pH, necessary to take advantage of the [*445] charged groups to attract biomolecules prior to covalent bonding. (D.I. 107 at 964)

G. The Scope of the '161 Patent

74. Claim 1 of the '161 patent is a generic claim directed to a hydrogel matrix coating suitable for use in a biosensor. Despite the high level of competition in the field following publication of the 1983 article demonstrating the practical application of evanescent wave technology in a biosensor, few, if any, functional commercial devices made it through development to market. (PX 35 at 94) Those that were developed employed planar surfaces and virtually all of them "attached the sensing layer of biological recognition molecules . . . directly to the evanescent wave sensor surface by physical adsorption." (PX 35 at 106; D.I. 104 at 272) These biosensors did not overcome the aforementioned salient problems of capacity, activity, and nonspecific binding. Until the launch of Biacore's first biosensor system [*65] in 1990, there were no affinity-based devices on the market. (D.I. 103 at 72)

75. The matrix coating disclosed in claim 1 comprises a hydrogel that is both bound to a surface and capable of binding the desired ligands. At the time of the invention, hydrogels in and of themselves and in matrix form were not only known but their employment for

ligand immobilization had been documented. (D.I. 104 at 224, 300-02; D.I. 106 at 761) Moreover, by November 1988, hydrogels had been used on surfaces in biosensors, albeit not in the fashion claimed in the '*161 patent*'. (D.I. 103 at 186, 196-97; D.I. 104 at 224, 300-01; D.I. 106 at 793) Furthermore, the means of binding a hydrogel to a surface, both metal and nonmetal, were known. (D.I. 106 at 793)

76. The hydrogel claimed in the '*161 patent*' is activated to contain both charged groups for concentrating biomolecules and reactive groups for covalently binding the concentrated biomolecules. Prior to November 1988, it was known to provide both charged groups and reactive groups on a polysaccharide gel for immobilizing ligands. (D.I. 104 at 240, 323-24; D.I. 106 at 767-68) Likewise, the literature had described hydrogels bound to a surface for use [**66] in a biosensor, which hydrogels contained both reactive groups and groups that could be charged. (D.I. 104 at 304, 323-24; D.I. 107 at 835-37) Prior to November 1988, the literature also taught in the context of biosensor technology the use of dextran modified with reactive groups to covalently bind biomolecules. (D.I. 104 at 300-01) Moreover, the activation chemistries necessary to effectively incorporate charged and reactive groups into a hydrogel, particularly a dextran hydrogel, were not only known in the art but had been employed in the context of ligand immobilization. (D.I. 104 at 234, 245-46; D.I. 106 at 763, 765, 767) It was also known that the result of such activation would be the presence of charged groups with the ability to immobilize ligands. (D.I. 104 at 234, 245-46; D.I. 106 at 763, 765, 767)

77. Dr. Scouten opined that as of November 10, 1988 it would have been obvious to one of ordinary skill in the art who wanted to do the type of ligand immobilization disclosed in the '*161 patent*' to have used both charged and reactive groups. (D.I. 107 at 900) Dr. Turner opined, however, that the literature, although it taught the presence in a hydrogel of groups that could be [**67] charged, did not teach that those groups, if charged, could, under the proper conditions, bring about the concentration of biomolecules. (D.I. 104 at 304) It was Dr. Turner's opinion that the literature, particularly that in the area of affinity chromatography, taught the use of a neutral hydrogel, such as dextran, so as to reduce the incidence of nonspecific binding. (D.I. 104 at 304)

78. As of November 1988, the literature with respect

to affinity chromatography taught generally that charge in the matrix was to be avoided. "Affinity chromatography is realized by covalently attaching a specific ligand which interacts with the desired macromolecule to an insoluble [**446] inert support." (PX 20 at 12) It involves the "immobilization of an appropriate ligand in such a way that the enzyme is still capable of recognizing and binding to the immobilized form of the ligand, whereas contaminating proteins . . . have no such recognition." (PX 490 at 531) Although the presence of charged entities in most enzyme immobilizations is not an important problem, in affinity chromatography "a combination of ion exchange and affinity can be either fortunate or unfortunate, depending upon charge and types of [**68] impurities, etc., to be removed by the chromatographic process." (PX 489 at 290) Accordingly, in the context of affinity chromatography an inert matrix or support was desired in order to avoid the nonspecific adsorption of proteins.

79. An article on affinity chromatography authored by Dr. Scouten stresses the importance of "the selection of the appropriate inert [i.e., nonreactive] matrix," stating that "nonspecific adsorption must not occur in the derivatized matrix." (PX 490 at 532) Among the many potential matrices for affinity chromatography cited by Dr. Scouten are dextran-coated glass, which he indicates exhibits "little or no adsorption," and cross-linked dextrans, which are related to cross-linked dextrans. (PX 490 at 532-33, 540) He notes that most of the matrices used for immobilization of enzymes have possible application in bioselective adsorption²⁶ but that few "have been used because of their potential for nonspecific adsorption either by charge . . . or by hydrophobic interactions." (PX 490 at 540) In the article, Dr. Scouten also emphasizes that attachment of ligands to the matrix must be performed in a manner that no charged, ionogenic, or hydrophobic residues [**69] remain after derivatization, which, he notes, is a "fact which has only recently been appreciated, and therefore must be kept in mind when reviewing the earlier literature." (PX 490 at 541; D.I. 107 at 885-86)

26 In bioselective adsorption, a type of affinity chromatography, affinity is based on biologically relevant binding. (PX 490 at 531)

80. Dr. Scouten agreed that the literature indicated a researcher would want to avoid charged groups in affinity chromatography in order to reduce nonspecific binding.

(D.I. 107 at 908) He asserted, however, that affinity chromatography is not the equivalent of enzyme immobilization generally much less enzyme immobilization in the context of biosensor technology. (D.I. 107 at 910) Dr. Scouten viewed affinity chromatography as a use of an immobilized ligand, not the immobilization of a ligand. (D.I. 107 at 945-49, 958-60) According to Dr. Scouten, the conditions for the two need not be the same, i.e., depending on the circumstances, particularly with respect to the desired [**70] use and/or function, the presence of charged groups in a matrix might be advantageous, might be problematic, or might be immaterial. (D.I. 107 at 945-49, 958-60) Thus, it was Dr. Scouten's belief that nonspecific binding is not a problem with respect to all biosensors. (D.I. 107 at 908-09) Dr. Scouten concluded that one skilled in the art who was familiar with the literature would be able to predict the conditions and charge concentrations desired for his/her desired use and/or function. (D.I. 107 at 945-49, 958-60)

81. Dr. Scouten also disagreed with Dr. Turner's assessment of dextran as being noncharged under normal circumstances. (D.I. 104 at 233; D.I. 107 at 889) Dextran is a naturally occurring polysaccharide that has both hydroxyl and carboxylic acid groups. (D.I. 107 at 890) These latter groups, according to Dr. Scouten, are either oxidized moieties or carboxyl groups that are naturally present from carboxyl-containing sugars. (D.I. 107 at 890) According to Dr. Scouten, the carboxylic acid groups incorporated within dextran confer upon the polysaccharide enough inherent charge to bring about a concentration of [**447] oppositely-charged biomolecules. (D.I. 106 at 782, 786-87; D.I. [**71] 107 at 889; see DX 517, DX 577, DX 573)

82. Dr. Scouten never tested T500, the dextran used in the examples in the '161 patent, to see if it did in fact possess a charge. Nonetheless, he was convinced that it did given its nature. ²⁷ (D.I. 107 at 892) Dr. Scouten, however, did test Sephadex, a dextran that has been cross-linked into bead form with epichlorohydrin to give a three-dimensional network of polymeric chains. (D.I. 107 at 890, 965) Experiments performed by Dr. Scouten for purposes of this litigation revealed that Sephadex does possess charged carboxylic acid groups, which groups Dr. Scouten did not believe to be the result of the cross-linking itself. (D.I. 106 at 785; D.I. 107 at 889-91; DX 576) The literature supports Dr. Scouten's determinations regarding the charged state of Sephadex:

Although Sephadex can be regarded as being essentially neutral, there is a small amount of residual negative charge in the purified, crosslinked polysaccharide presumably caused by carboxylic acid groups. This can be eliminated by condensation of these carboxyl groups with glycinamide using a water-soluble carbodiimide.

(DX 517 at 7; see also DX 577 at 341 (finding [**72] that the data demonstrated that the results of gel filtration experiments were effected by a variety of factors, including "the small amount of ionized carboxylic groups in the" Sephadex))

27 Technical grade dextran, as is T500, is the least purified and, therefore, has not had any treatment that would remove naturally occurring carboxyl residues. (D.I. 107 at 892) Consequently, if Dr. Scouten's opinions regarding the charged state of naturally occurring dextran are accurate, T500 has the greatest potential for electrostatic binding. (D.I. 107 at 892)

83. Dr. Scouten's belief regarding the charged state of dextran conflicts with those of the Thermo researchers. According to an internal Thermo memorandum prepared by Dr. Davies, experiments conducted to determine the need for anchoring dextran to the RM using epoxy silane revealed that a chip coated with noncarboxylated T500 dextran ²⁸ attracted a greatly reduced amount of protein when compared to a chip without a hydrogel coating. (PX 83 at 109342) Dr. Scouten [**73] disagreed with Dr. Davies' evaluation of the data, commenting that it could be that the surface of the chip itself was highly adsorptive to protein and that the dextran coating prevented the protein from reaching the surface. (D.I. 107 at 894-97) In fact, Dr. Scouten felt that the slight shift from baseline exhibited by the unmodified dextran demonstrated that the unmodified dextran, in fact, did concentrate protein, although he could not state how much protein was bound. (D.I. 107 at 897-98)

28 The T500 dextran was activated to contain reactive groups (succinimide esters) using EDC/NHS, a standard activation technique for activating a carboxyl group. (PX 83 at 109342; PX 494 at 78-79, 84) The dextran was not

modified, however, to contain charged groups (i.e., it was not carboxylated). (PX 83 at 109342; PX 494 at 78-79, 84)

H. The Biacore Biosensor

84. The Biacore biosensor is composed of three parts: the sensor chip; the microfluidic system, which makes sure that liquids arrive at the sensor chip surface [**74] at the correct time and in the correct amounts; and the optical detection system, which measures and monitors the reaction occurring on the sensor surface. (D.I. 103 at 73-74) Biacore holds separate patents on each part of the system. (D.I. 103 at 90)

85. Biacore began marketing its automated, optical biosensor system in the United States in 1990 at a cost of \$ 200,000 per system. (D.I. 96 at 5; D.I. 104 at 361-62) Biacore's biosensor was the first real-time, label-free kinetic ²⁹ analyzer on the [**448] market. (D.I. 103 at 74-77, 101) In fact, at the time of its launch, no other affinity-based biosensors were commercially available. Consequently, in order to succeed Biacore had to create a market for a technology for which there was no existing demand. (D.I. 103 at 76-77) Biacore, therefore, undertook an active and aggressive marketing campaign, targeting life science researchers in both academia and industry. ³⁰ (D.I. 103 at 77, 85)

²⁹ Kinetics is "the rate behavior of a physical or a chemical system." Dictionary of Biochemistry 263.

³⁰ Academic labs constitute 60-70% of Biacore's market while industrial labs, pharmaceutical companies, and large research labs constitute 30-40%. (D.I. 103 at 85)

[**75] 86. The initial response to Biacore's biosensor was overwhelmingly favorable. (D.I. 103 at 77) Biacore attributed the success of its sensor to the dextran hydrogel matrix since sales of its sensors possessing other types of sensing surfaces were (and continued to be up to the time of trial) markedly lower. ³¹ (D.I. 103 at 108-09) Although at first researchers did not recognize the significance of Biacore's dextran matrix, they quickly realized it was a landmark achievement in the area of bioanalytical sciences. (D.I. 104 at 276; PX 35) Peter Garland, a Thermo consultant and a commentator in the biosensor field, noted in 1996 that

whereas physical adsorption could be

said to have the finesse of a hurricane dumping boats on a foreshore, the methods more recently developed by Johnson and colleagues . . . are comparable to skillful anchoring. Although developed for the specific case of covalently coupling molecules to the gold surface of an SPR device, they are applicable with minor modifications to all evanescent wave devices. They have been adapted for RM usage, and could readily be used with advantage in TIRF and ATR techniques.

(PX 35 at BIA 011061) Claire Morgan, [**76] a Thermo customer, noted in a 1996 article that

the two widely available immunosensors are both direct optical systems--the BIAcore and the IAsys--and both have surfaces of carboxylated dextran. These have proved to have very low nonspecific binding in biological matrices and achieve good detection limits for a variety of molecules, but their major impact has been to revolutionize the kinetic rate analysis of biomolecular interactions.

(PX 38 at BIA 010149) Thermo in its own marketing describes the dextran hydrogel matrix as the "original sensor surface for biomolecular interactive analysis and hence the most extensively studied and versatile." (D.I. 96 at 3)

³¹ The same is true with respect to Thermo's sales: sales of dextran cuvettes dwarf sales for other types. (PX 473; PX 244 at 104175; PX 126 at 108483)

I. Thermo's Search For Biosensor Technology

87. In 1987, Fisons joined a research collaboration with GEC-Marconi and the Institute of Biotechnology, University of Cambridge, charged [**77] with the development of an evanescent wave biosensor employing RM technology. (D.I. 105 at 414-15; JX 4 at 101867) RM technology was selected for study because (1) it showed itself to be a very sensitive biosensor; (2) it was easy to manufacture; and (3) it had the potential to be more sensitive than many of the then available biosensors. (D.I. 105 at 416-17) In May 1990 the collaborating researchers

gave a presentation to a consultant of Fisons who was to evaluate the progress of the group to date to ascertain whether the work warranted formation of a new company. (D.I. 105 at 424-25) At that presentation Dr. Davies, who at the time was working for the Institute of Biochemistry on the surface chemistry aspect of the biosensor project,³² proposed using a hydrogel on an RM sensing surface in order to immobilize ligands. (D.I. 105 at [*449] 424-25; DX 558 at 100798; JX 22 at 109) Determining that the research merited formation of a new company, in August 1990, Fisons created a new division devoted exclusively to developing biosensors based upon RM technology. (D.I. 105 at 415-16) This division, Fisons Applied Sensor Technology, subsequently became known as Affinity Sensors. (D.I. 96 at 3) [*78]

32 Dr. Davies joined Affinity Sensors at the time of its formation in August 1990. At the time of trial, however, he was no longer an employee of Affinity Sensors.

88. In September 1990,³³ Steve Jones, Fison's British patent counsel, who had run a patent search of Pharmacia's patents on biosensors at the request of technical personnel with Affinity Sensors, furnished the research staff and managing director of Affinity Sensors with a copy of the published PCT application. (D.I. 105 at 426-29, 464-67, 489) The researchers, as well as the managing director of Affinity Sensors, reviewed the PCT application and determined that it did not present a problem to Fison's development of an RM biosensor. (D.I. 105 at 426-29, 464-67, 489) It was their belief that (1) the PCT claims were entirely restricted to metal surfaces, which RM technology does not involve, and (2) the description in the PCT was restricted to X-R-Y chemistry, which is not applicable to the dielectric surfaces that Applied Sensors was using in its [*79] RM biosensors. (D.I. 105 at 426-29, 464-67, 489) A few weeks later, Colin H. Maule, Ph.D. who was at that time an Affinity Sensors' researcher, discussed the PCT application with Jones. (D.I. 105 at 430)

33 Also in September 1990, Dr. Davies attended a meeting in Cleveland, Ohio where presentations by Pharmacia representatives revealed that Pharmacia was using a dextran hydrogel in its biosensor. (D.I. 494 at 44-45)

89. Despite having proposed the idea in May 1990, Dr. Davies did not begin experimenting with attaching hydrogels to the sensing surface of an RM biosensor in

order to immobilize ligands until in or about June 1991. (D.I. 105 at 430-31; JX 22 at 109) Prior to this time, the researchers at Affinity Sensors had experimented with a number of surface materials and chemistries, including adsorption, phenethylsilane, aminosilane, glutaraldehyde, and lanthanum chloride. (D.I. 105 at 431-34; PX 446) Although not failures per se, none of these attempts yielded a surface capable of immobilizing the requisite [*80] concentration of ligands. (D.I. 105 at 460-65, 483-85) Dr. Davies indicated in his laboratory notebook that as of May 20, 1991, he had

had no success in increasing the amount of human IgG adsorbed to the resonant mirror by the surface treatments so far employed. . . . Maximizing the attractive electrostatic forces probably only increases the initial rate of adsorption, but in these experiments we found no benefit in increasing the electrostatics. Glutaraldehyde activated aminosilane-coated surfaces seemed to be the best from the view of resistance to detergent elution. However it is probably likely, in my view, that covalent immobilization to a solid surface will reduce the binding activity of the antibody.

(JX 22 at 107322)

90. Dextran was the first hydrogel selected by Dr. Davies for experimentation. It was selected because prior research involving dextran had shown it to work in similar systems. (D.I. 105 at 455-56; PX 61 at 109250; PX 494 at 72-73) Specifically, Dr. Davies used T500 dextran purchased from Pharmacia. (D.I. 105 at 457) Although the Affinity Sensors researchers experimented with dextrans other than T500 (e.g., dextrans from suppliers other than Pharmacia [*81] and dextrans of varying molecular weight), T500 dextran remained their hydrogel matrix of choice for the better part of the 1991-1995 time period. (D.I. 105 at 477-80) Other hydrogels were not substituted for the CM-dextran primarily because it worked well and it was not covered by a patent of which the Affinity Sensors researchers were aware. (D.I. 105 at 480)

91. Unlike SPR biosensors, which primarily employ metallic surfaces, RM biosensors employ materials, such as glass, that are transparent to the wavelengths of

[*450] light being used. (D.I. 105 at 417-18) Consequently, the linking chemistry described in the PCT application was not entirely suitable for the Affinity Sensors researchers' purposes. Thus, the researchers were responsible for developing a means of affixing the hydrogel to the nonmetallic surfaces employed in RM biosensors. Moreover, Dr. Davies questioned the benefits of incorporating charged carboxyl groups into a dextran hydrogel:

Rather than use the method adopted by Pharmacia for their BiaCore devices I have decided to explore a different chemistry. The Pharmacia coupling process may have unwanted effects on our devices, and also residual carboxylate groups [*82] may cause nonspecific binding.

(JX 5 at 109229) By late November 1991, however, experiments conducted by the Affinity Sensors scientists had demonstrated the beneficial role of electrostatic attraction in ligand immobilization. (PX 92; PX 93)

92. In early 1996, ³⁴ after several years of experimentation, during which a large number of surface chemistries and surface materials were tested, the scientists at Affinity Sensors finally developed the surface chemistry employed in the IAsys TM device at the time of trial. (D.I. 105 at 438, 442-44) Essentially the method involves binding the hydrogel disclosed by Pharmacia to the ion surface of a RM biosensor using known linking chemistries. (D.I. 104 at 317-18; D.I. 105 at 460)

34 The methods employed by Thermo at the time of trial were developed "some time after [it] had gone commercial." (D.I. 105 at 438) The general sequence of steps employed has been the same, however, since Thermo began marketing the IAsys TM system. (D.I. 105 at 443)

93. The off-chip [*83] carboxymethylation procedure developed by Affinity Sensors to affix the dextran hydrogel to the nonmetal RM surface involves a two-step progression. In the first step, unbound CM-dextran is made by reacting dextran in solution with bromoacetic acid and sodium hydroxide. (D.I. 105 at 440, 457; DX 565 at 101044; PX 61; PX 494 at 78-79) This unbound CM-dextran then is activated using EDC/NHS

to contain a reactive ester in the form of a succinimide ester and charged carboxyl groups. (D.I. 105 at 440, 457; DX 565 at 101044; PX 61; PX 494 at 78-79) In the second step, the unbound and activated dextran is attached to the RM surface using amino groups. (D.I. 105 at 440-41, 442-44, 480-81; DX 565 at 101046-47; PX 494 at 80) The process results in a dextran hydrogel matrix bound to a surface, said hydrogel being activated to contain charged groups and reactive groups that are carboxyl groups, some of which are in the form of succinimide esters. (PX 46 at 3; PX 156; PX 432 at 2-3; PX 494 at 84-86) This sequence of steps was adopted because (1) it allows for greater control over the level of carboxylation and (2) the harsh reactants needed to carboxylate the methyl groups are detrimental to the [*84] cuvette surface employed in the IAsys TM biosensor. ³⁵ (D.I. 105 at 440; PX 494 at 80) Although the progression of steps is reversed, the methodology is equivalent to that described by the Pharmacia researchers in the PCT application. (D.I. 105 at 457-58; PX 494 at 53-54) The CM-dextran that results is the same regardless of the sequence of steps employed. (D.I. 105 at 481, 482-83; PX 104)

35 In Thermo's biosensor systems, the activated dextran matrix is bound to the surface of a disposable cuvette. (D.I. 96 at 4) In contrast, the activated dextran matrix is bound to the surface of a disposable "chip" in Biacore's devices. (PX 360 at BIA 003083, BIA 003092)

94. Affinity Sensors did not attempt to hide the fact that it was employing the sensing surface developed by Biacore in its RM biosensor. Dr. Denise Verna Pollard-Knight, who at the time was a bioscience manager at Fisons, freely admitted at the World Congress on Biosensors held in Geneva, Switzerland in May 1992, that Affinity Sensors' instrument would include [*85] a [*451] CM-dextran hydrogel as set forth in the PCT application bound to a nonmetal surface of an RM biosensor. (D.I. 104 at 282-83) A number of Biacore representatives attended this meeting. (D.I. 104 at 281-83, 319-20; D.I. 105 at 444-47) In addition, a PCT application filed by Fisons on June 2, 1992 and published on December 10, 1992 described the type of biosensor under development as comprising

a layer of dielectric material, at least a part of which is coupled to a biocompatible porous matrix containing

immobilized biochemicals. . . . Most conveniently, the porous matrix is a hydrogel, e.g. a hydrogel selected from the group consisting of polysaccharides, e.g. agarose, dextran, carrageenan, alginate acid, starch, cellulose, and derivatives thereof, e.g. carboxymethyl derivatives, xanthin gum, pectin, and a water-swellaible organic polymer such as polyvinyl alcohol, polyacrylic acid, polyacrylamide, and polyethylene glycol.

(JX 2 at 100542) Furthermore, in an article published in *Biosensors and Bioelectronics* in 1993,³⁶ the authors, research scientists at Fisons, stated that the use of a modified dextran layer was the optimal method for indirect covalent attachment [*86] of molecules at dielectric surfaces. (PX 27 at 359) The authors acknowledged that this method "had been described previously for gold surfaces for use with sensors based on SPR" by researchers at Pharmacia. (PX 27 at 359; D.I. 104 at 283-85)

36 The article, entitled *The Resonant Mirror: A Novel Optical Sensor for Direct Sensing of Biomolecular Interactions Part II: Applications*, was authored by P.E. Buckle, R.J. Davies, T. Kinning, D. Yeung, P.R. Edwards, and D. Pollard-Knight and published in *Biosensors & Bioelectronics*, Vol. 8, in 1993.

95. On March 9, 1993, Affinity Sensors gave its first public demonstration of the IASys™ biosensor at the Biochemistry Society Meeting in Leeds, England. (DX 568) Biacore representatives were present at this demonstration and details of Affinity Sensors' devices were passed on in memorandum form to Biacore management. (DX 568) Two months later, on May 10, 1993, Biacore submitted the '265 continuation application to the PTO. (PX 3)

96. Thermo's first sale of its manual [*87] IASys TM biosensor in the United States was made in February 1994. (D.I. 96 at 3; D.I. 105 at 448)

J. Thermo's Evaluation of the '161 Patent

97. The '161 patent issued on July 25, 1995. On September 5, 1995, David Fortune, the managing director of Pharmacia, wrote Thermo advising it of the '161 patent's existence. (D.I. 105 at 467; PX 210; D.I. 96 at 4)

Dr. Maule discussed the letter's content and the patent's implication with Mr. Fortune at a meeting held on September 7, 1995, the day Thermo received the letter. (D.I. 105 at 468-69; D.I. 96 at 4) Also in attendance were Doug Stewart, Peter Lowe, Jim Molloy, and possibly Dr. Davies. (D.I. 105 at 468-69; D.I. 96 at 4) At the meeting, the attendees discussed (1) whether the '161 patent was valid, (2) whether the IASys™ biosensor was covered by the claims of the '161 patent, and (3) whether one of ordinary skill in the art would think that the '161 patent related only to SPR technology and/or only to metal surfaces. (D.I. 105 at 469-74; PX 193) It was decided that Mr. Jones should obtain a copy of the file history of the '161 patent. (D.I. 105 at 469-74; D.I. 96 at 4) On September 8, 1995, Affinity Sensors wrote Pharmacia, stating [*88] that it would respond to Pharmacia's letter in due course. (D.I. 96 at 4)

98. The attendees met again on October 5, 1995. (D.I. 105 at 466, 469-74; D.I. 96 at 4; PX 497 at 17-18, 55) This time they were joined by Mr. Jones and David Yorke, another member of Fison's British patent counsel. (D.I. 105 at 466, 469-74; D.I. 96 at 4; PX 497 at 17-18, 55) Once again the discussion concerned whether Affinity Sensors was infringing the '161 patent. (D.I. 105 at 466, 469-74; D.I. 96 at 4; PX 497 at 17-18, 55) The attendees determined to seek the opinion of an American attorney regarding the validity and scope of the '161 [*452] patent. (D.I. 105 at 466, 469-74; D.I. 96 at 4) Mr. Lowe's handwritten notes from this meeting contain the notation "We Infringe!" (PX 193 at 106699)

99. Subsequently, Affinity Sensors' management team contacted Mr. Rodger Van Kirk, Esquire, a U.S. patent attorney, and the firm of Nixon Hargraves. Although counsel was contacted in December 1995 regarding their respective evaluations of the '161 patent, 37 a written opinion was never issued by either Mr. Van Kirk or by the firm of Nixon Hargraves. 38 (D.I. 105 at 474-76) Although thoughts of redesigning the CM-dextran cuvette [*89] used in the IASys™ biosensor were discussed briefly, no action in this direction was taken. (D.I. 105 at 476; D.I. 96 at 5)

37 The content of these discussions was not disclosed to the court.

38 On September 18, 1996, Thermo filed a prospectus with the U.S. Securities and Exchange Commission wherein it stated that it had not obtained an opinion of counsel with respect to the

'161 patent. (D.I. 96 at 5)

100. On July 24, 1996, Thermo's attorneys filed an amendment to its pending patent application. Serial No. 667,323, directed to its RM biosensor technology.³⁹ (PX 16, Tab 15) The amendment contains a set of claims that are duplicative of the claims in the '161 patent. (PX 16, Tab 15 at 102137-40) The amendment explicitly states that these claims were copied from the '161 patent.⁴⁰ (PX 16, Tab 15 at 102137-40)

39 This application claimed an effective filing date of June 4, 1991, based on a United Kingdom patent application. (PX 16, Tab 1 at 100519) [**90]

40 At trial, Thermo asserted that it had copied the claims in order to provoke an interference action challenging the validity of the '161 patent claims before the PTO pursuant to 35 U.S.C. § 135.

101. In a memorandum to Mr. Jones dated November 27, 1996, Dr. Davies commented that "for me the Pharmacia patent was inventive in that it demonstrated electrostatic concentration of protein into a matrix on a surface, and this matrix preserved the activity of the protein coupled to it." (PX 214)

K. The Battle for the Biosensor Market

102. Thermo began selling its manual IAsys TM biosensor in the United States in February 1994⁴¹ at a price of \$ 80,000. (D.I. 96 at 3; PX 295 at 106039; PX 495 at 145) Since it possessed the activated dextran matrix found in the BIAcore TM biosensor, the IAsys TM biosensor was marketed as a low cost alternative to the automated BIAcore TM system. (PX 22 at 103702; PX 29 at 100091; PX 259 at 103737) In anticipation of Thermo's marketing of the less expensive IAsys TM device, Biacore introduced in the fall of 1993 a manual biosensor, marketed [**91] under the name BIALite TM. (D.I. 103 at 111; PX 501 at 83-85)

41 Although the first sale did not occur until early 1994, demonstration models were available in 1993.

102. Biacore subsequently introduced other versions of its biosensor. In the fall of 1994, Biacore began marketing the automated BIAcore TM 2000 and, in the spring of 1995, the automated BIAcore TM 1000. This

latter model was a less expensive instrument and possessed fewer features. In the spring of 1996, Biacore introduced the manual BIAcoreX TM. At the same time, it eliminated the original BIAcore TM biosensor and the BIALite TM instruments from its product line. The BIAcore TM 2000 is Biacore's largest selling instrument.

104. At the time of trial, Thermo marketed three different biosensors in the [**53] United States: (1) the manual IAsys TM instrument; (2) the automated IAsys TM auto<+>; and (3) the automated IAsys TM auto<+> advantage. (D.I. 96 at 3) Thermo's first sale of an automated system in the United States occurred on May 21, 1996. (D.I. [**92] 96 at 3) The manual IAsys TM device continued to be Thermo's largest selling biosensor at the time of trial.

105. Along with the device itself, Thermo provides its customers with instructional materials regarding the use of the IAsys TM biosensor. Among other things, the customers are given a Methods Guide (PX 169) and Protocol 1.1 (JX 20) that inform them how to convert some but not all of the carboxyl groups on the CM-dextran to reactive succinimide esters. The manuals go on to instruct the customers how to use the CM-dextran cuvette in the biosensor in order to electrostatically concentrate ligands into the dextran matrix and covalently bind ligands so concentrated. (JX 20; PX 169) In addition, Thermo supplies its customers with application notes and promotional literature demonstrating the benefits and uses of the IAsys TM biosensor. (JX 8-19; PX 141-143; PX 147)

106. In addition to its CM-dextran cuvette, at the time of trial, Thermo offered for sale cuvettes bearing aminosilane, biotin, carboxylate, hydrophobic, and uncoated surfaces. (D.I. 105 at 502-06) All of these cuvettes are interchangeable to the extent that they all fit into the IAsys TM biosensor. (D.I. 105 at 506) [**93] Each surface possesses unique properties making it suitable for particular applications. (D.I. 105 at 502-06, 512-16) There is, however, enough overlap between the properties, features, and particular uses of each surface that the nondextran cuvettes "cover all the things that dextran [cuvettes] can do." (D.I. 105 at 532, 539-41) Until 1996, Thermo offered for sale only CM-dextran and aminosilane cuvettes. (D.I. 106 at 664) The biotin and carboxylate surfaces were introduced in 1996 and the hydrophobic surface in 1997. (D.I. 106 at 520, 523)

III. CONCLUSIONS OF LAW

A. Jurisdiction

1. As a threshold matter, Biacore argues that the court lacks subject matter jurisdiction with respect to all claims of the '161 patent other than claims 4 and 5. Biacore originally accused Thermo of infringing the '161 patent generally by the manufacture, use, and sale of biosensor systems embodying the claimed invention. (D.I. 1) Thermo counterclaimed seeking declaratory judgment, pursuant to the Declaratory Judgment Act, 28 U.S.C. § 2201, of noninfringement and invalidity of the '161 patent. (D.I. 6) Although identifying in the pre-trial order claims 1-5, 9-11, and [**94] 15 of the '161 patent as being infringed by Thermo, Biacore on the first day of trial limited "for the purposes of the trial" its charges to claims 4 and 5. (D.I. 96; D.I. 103 at 4) Biacore, therefore, asserts that the court has no jurisdiction over claims 1-3, 9-11, and 15 because a "a case or controversy" no longer exists with respect to those claims. (D.I. 114 at 21 n.21) Thermo disagrees, stating that its counterclaim of invalidity still exists even after Biacore's withdrawal. (D.I. 112 at 2 n.1)

2. It is axiomatic that a case or controversy is a jurisdictional predicate for declaratory judgment under § 2201. See *Grain Processing Corp. v. American Matze-Products*, 840 F.2d 902, 905 (Fed. Cir. 1988). This requirement precludes a party from asserting a claim of noninfringement or invalidity unless the defendant objectively has a "reasonable apprehension that it will face an infringement suit." *Jervis B. Webb Co. v. Southern Sys., Inc.*, 742 F.2d 1388, 1398 (Fed. Cir. 1984). The existence of a sufficiently concrete dispute between the parties, however, vanishes when subsequent events render the threat of infringement nonexistent. See *Super Sack Mfg. Corp. v. Chase Packaging Corp.*, 57 F.3d 1054, 1058 (Fed. Cir. 1995). [**95]

3. Nonetheless, a court is not automatically denied jurisdiction over counterclaims [**454] upon the withdrawal of an allegation of infringement.

In a typical case where the patentee institutes an action for infringement and the alleged infringer counterclaims that the patent is invalid and unenforceable and/or non-infringed, courts will allow the action to go forward on the counterclaim even if the patentee voluntarily dismisses the charge of infringement or stipulates to the

non-infringement.

Akzona, Inc. v. E.I. du Pont de Nemours & Co., 662 F. Supp. 603, 619 (D. Del. 1987). For the court to maintain jurisdiction, however, the defendant must "establish by a preponderance of the evidence . . . that it has a reasonable apprehension that it will be sued" on the nonasserted claims. *Shell Oil Co. v. Amoco Corp.*, 970 F.2d 885, 887 (Fed. Cir. 1992). The Federal Circuit has established a two-part test to determine if a party is in reasonable apprehension of being sued by a patent holder on a particular claim:

There must be both (1) an explicit threat or other action by the patentee, which creates a reasonable apprehension on the part of [**96] the declaratory plaintiff that it will face an infringement suit, and (2) present activity which could constitute infringement or concrete steps taken with the intent to conduct such activity.

BP Chems. Ltd. v. Union Carbide Corp., 4 F.3d 975, 978 (Fed. Cir. 1993).

4. In the case at bar, Thermo maintains a reasonable apprehension of an infringement suit on the nonasserted claims. Biacore's citation to *Grain Processing* to illustrate the absence of jurisdiction is misplaced. In *Grain Processing* the Federal Circuit noted that the plaintiff had "abandoned its charge that [defendant] had infringed . . . and . . . 'steadfastly refused to assert infringement' of those claims. There [was] nothing in the record to suggest that [defendant would] be faced with a similar infringement suit in the future." 840 F.2d at 906 (emphasis added); see also *Biogen, Inc. v. Amgen, Inc.*, 913 F. Supp. 35, 40 (D. Mass. 1996) (holding that "in light of [the patent holder's] latest representation that it will relinquish forever the right to sue [defendant] on any claims other than [the asserted claims], [defendant's] counterclaim [**97] will be dismissed"). In stark contrast, there is no indication in the record at bar that Biacore has stipulated to noninfringement of claims 1-3, 9-11, and 15 of the '161 patent. This court previously has held that the absence of a formal covenant not to sue or a willingness to accept a judgment of noninfringement creates a reasonable apprehension of suit. See *Mobil Oil Corp. v. Advanced Envtl. Recycling Techs., Inc.*, 826 F. Supp. 112, 114 (D. Del. 1993). Moreover, the fact that Thermo is currently litigating allegations of infringement as to dependent claims 4 and 5 of the same patent further

supports that apprehension. The court, therefore, will retain jurisdiction as to the invalidity of claims 1-3, 9-11, and 15 of the '161 patent.

B. Infringement

5. Biacore contends that Thermo's CM-dextran cuvette, which is used in Thermo's 1Asys TM biosensors, literally infringes claims 4 and 5 of the '161 patent. Biacore's claim is based upon 35 U.S.C. § 271, which provides in relevant part that

except as otherwise provided in this title, whoever without authority makes, uses, offers to sell, or sells any patented invention, within the [**98] United States . . . during the term of the patent therefor, infringes the patent.

35 U.S.C. § 271(a). The Federal Circuit has set forth a two-step analysis for determining whether there is infringement:

First, the claims must be correctly construed to determine the scope of the claims. Second, the claims must be compared to the accused device.

Kahn v. General Motors Corp., 135 F.3d 1472, 1476 (Fed. Cir. 1998). "To establish literal infringement, a plaintiff must demonstrate that every limitation in the claim is literally met by the accused device." *Id.* [**455] In other words, literal infringement exists when the claim, as construed by the court, reads on the accused device exactly. See *Engel Indus. v. Lockformer Co.*, 96 F.3d 1398, 1405 (Fed. Cir. 1996). Infringement may not be avoided simply by adding features or components not required by the claims. See *Loctite Corp. v. Ultraseal Ltd.*, 781 F.2d 861, 865 (Fed. Cir. 1985), overruled on other grounds, *Nobelpharma AB v. Implant Innovations, Inc.*, 141 F.3d 1059 (Fed. Cir. 1998). Plaintiff has the burden of demonstrating by a [**99] preponderance of the evidence that "every limitation of the claim is literally met by the accused device." *Kahn*, 135 F.3d at 1476.

1. Claim Construction

6. It is the court's "power and obligation to construe as a matter of law the meaning of language used in the patent claim." *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 979 (Fed. Cir. 1995). The principles of claim construction are well established. The exercise begins

with the claim language, which defines the scope of the claim. See *York Prods., Inc. v. Central Tractor Farm & Family, Inc.*, 99 F.3d 1568, 1572 (Fed. Cir. 1996). In analyzing claim language, the court must employ "normal rules of syntax," *Eastman Kodak Co. v. Goodyear Tire & Rubber Co.*, 114 F.3d 1547, 1553 (Fed. Cir. 1997), for "[a] claim must be read in accordance with the precepts of English grammar." *In re Hyatt*, 708 F.2d 712, 714 (Fed. Cir. 1983). The court also must ascribe to any technical term used in a claim "the meaning that it would be given by persons experienced in the field of the invention, unless it is apparent from the patent and the prosecution history [**100] that the inventor used the term with a different meaning." *Hoechst Celanese Corp. v. BP Chems. Ltd.*, 78 F.3d 1575, 1578 (Fed. Cir. 1996).

7. In order to give context to the claim language, the court also must review the specification. The Federal Circuit has explained that

the specification acts as a dictionary when it expressly defines terms used in the claims or when it defines terms by implication. As we have repeatedly stated, "claims must be read in view of the specification, of which they are a part." The specification contains a written description of the invention which must be clear and complete enough to enable those of ordinary skill in the art to make and use it. Thus, the specification is always relevant to the claim construction analysis. Usually, it is dispositive: it is the single best guide to the meaning of the disputed term.

Vitronics Corp. v. Conceptronic, Inc., 90 F.3d 1576, 1582 (Fed. Cir. 1996) (citations omitted).

8. The last source of intrinsic evidence relevant to claim construction is the prosecution history of the patent where it is in evidence. The prosecution history contains the complete record of all [**101] the proceedings before the PTO. "including any express representations made by the applicant regarding the scope of the claims." *Id.* at 1583. The prosecution history, therefore, "is often of critical significance in determining the meaning of the claims." *Id.*

9. The court also may consider, in its discretion,

extrinsic evidence "to assist in its construction of the written document." *Markman*, 52 F.3d at 981. In most instances, however, extrinsic evidence of claim meaning is improper. See *Vironics Corp.*, 90 F.3d at 1582. "Extrinsic evidence consists of all evidence external to the patent and prosecution history, including expert and inventor testimony, dictionaries, and learned treatises." *Markman*, 52 F.3d at 980. Neither the patent's prosecution history nor any extrinsic evidence considered can "enlarge, diminish, or vary" the limitations in the claims. Id.

10. **Product-by-process claims.** As an initial matter, Thermo argues that claims 4 and 5 of the '161 patent are product-by-process. [*456] claims that incorporate the "process steps" disclosed in claim 1. Thermo contends that the claim language supports this [*102] argument. According to Thermo, claim 4, which incorporates the limitations of claim 1, requires that the dextran hydrogel disclosed be formed through a two-step progression: first, the dextran "is bound to a surface," and then the bound dextran "is activated to contain" both charged and reactive groups. (D.I. 115 at 3-7) Thermo argues that such a construction is consistent with the specification, which broadly describes first attaching dextran to the surface and then activating the bound dextran for purposes of binding ligands. (PX 1, col. 6, lns. 43-47; see also PX 1, col. 9, lns. 45, 51, 54-56) Relying on the Federal Circuit's decision in *Atlantic Thermoplastics Co. v. Faytex Corp.*, 970 F.2d 834, 846-47 (Fed. Cir. 1992), Thermo contends that these process terms serve as limitations that must be proven in order to find infringement.

11. The product - product-by-process claim dichotomy is not absolute or clear cut in application. Product-by-process claims are characterized as being devoid of significant structural description of the final article, instead relying, at least in part, on a description of "the process used to obtain [the claimed invention]" to define [*103] it. *Mentor Corp. v. Coloplast, Inc.*, 998 F.2d 992, 997 (Fed. Cir. 1993). By contrast, in product claims the article is defined in terms of structural characteristics only. The mere use in a claim of structural or characterizing terms derived from processes or methods, however, does not prevent a claim from being considered a true product claim. See *Application of Hughes*, 496 F.2d 1216, 1219 (C.C.P.A. 1974); In *Application of Gorner*, 56 C.C.P.A. 1289, 412 F.2d 276, 279 (C.C.P.A. 1969). Nor does the use of a process

limitation convert a pure product claim to a product-by-process claim. See *Promson v. Advance Offset Plate, Inc.*, 720 F.2d 1563, 1570 (Fed. Cir. 1983). Typically, it is the wording of the claim which indicates that it is a product-by-process claim. For example, product-by-process claims employ terms such as "prepared in accordance with," "by the process of," whereby, "product of the process," "resulting from the process of," and "being produced by the process comprising." See, e.g., *In re Thorpe*, 777 F.2d 695, 696 (Fed. Cir. 1985); *In re Fessmann*, 489 F.2d 742, 180 U.S.P.Q. 324, 324 (C.C.P.A. 1974); [*104] *Application of Hughes*, 496 F.2d 1216, 1217 (C.C.P.A. 1974); *Scripps Clinic & Research Found. v. Genentech, Inc.*, 666 F. Supp. 1379, 1385 (N.D. Cal. 1987); *Johnson & Johnson v. W.L. Gore & Assoc., Inc.*, 436 F. Supp. 704, 709 (D. Del. 1977); *Ex parte Edwards*, 231 U.S.P.Q. 981, 982 (P.T.O. 1986).

12. Consistent with the above, the court concludes that the claims at issue are not product-by-process claims. Claim 1 of the '161 patent contains none of the wording traditionally associated with product-by process claims. (P. 37) ⁴² Despite Thermo's contentions to the contrary, the phrases "which is bound" and "activated to contain" reflect structural limitations not the process by which the claimed invention is obtained. Nor is there anything in the record to indicate that Biacore distinguished the claimed invention from the prior art based on the novelty of the invention's process. Accordingly, claims 4 and 5, which depend in part from claim 1, are best characterized as pure product claims since the disclosed invention is described by its structure rather than how it is made. As such, claims 4 and 5 may encompass identical [*105] products formed by different processes.

42 The indicated paragraphs refer to Part II, Findings of Fact.

13. **Preamble limitation.** The parties do not contest the interpretation of any particular term in the claims of the '161 patent. Instead, they contest the limitation, if any, imposed by the phrase in the preambles to independent claims 1 and 15 "suitable for use in a biosensor." Biacore argues that the phrase defines the invention [*457] as a biosensor matrix. (D.I. 111 at 12-13) Consistent with this construction, Biacore maintains that the claims are limited to an activated hydrogel matrix that is employed under conditions in which the charged groups actually are bringing about a

concentration of oppositely-charged biomolecules which are then covalently bound to the matrix coating by the reactive groups. (D.I. 111 at 12-13) Thermo, on the other hand, contends that the phrase imposes no such limitation, arguing that the claims of the '161 patent are directed to a structure having a recited capability not to [*106] a method of immobilizing ligands on a hydrogel. (D.I. 112 at 7-9)

14. "[A] claim preamble has the import that the claim as a whole suggests for it." *Bell Communications Research, Inc. v. Viatelink Communications Corp.*, 55 F.3d 615, 620 (Fed. Cir. 1995). Generally, a claim preamble, when read in the context of the entire claim, recites claim limitations only if "the claim cannot be read independently of the preamble and the preamble must be read to give meaning to the claim or is essential to point out the invention." *Morsion v. J.C. Penney Co.*, 353 F.2d 976, 986 (4th Cir. 1965) (citing *Kropa v. Robie*, 38 C.C.P.A. 858, 187 F.2d 150 (C.C.P.A. 1951)). Thus, "if a claim preamble is 'necessary to give life, meaning, and vitality' to the claim, then the claim preamble should be construed as if in the balance of the claim." *Pinney Bowes, Inc. v. Hewlett-Packard Co.*, 182 F.3d 1298, 1305 (Fed. Cir. 1999) (quoting *Kropa*, 187 F.2d at 152).

Indeed, when discussing the "claim" in such a circumstance, there is no meaningful distinction to be drawn between the claim preamble and the rest of the claim, for [*107] only together do they comprise the "claim." If, however, the body of the claim fully and intrinsically sets forth the complete invention, including all of its limitations, and the preamble offers no distinct definition of any of the claimed invention's limitations, but rather merely states, for example, the purpose or intended use of the invention, then the preamble is of no significance to claim construction because it cannot be said to constitute or explain a claim limitation.

Id.

15. In the case at bar, the preamble statement "suitable for use in a biosensor" does not merely state a purpose or intended use for the claimed structure. Rather,

the phrase informs the construction of the remainder of the claims by defining the matrix coating. The body of the claims is directed to an article that cannot be divorced from the intended field of use. It is only under the conditions imposed by the phrase "suitable for use in a biosensor" that the elements of the claims perform the functions by which they are defined. Thus, the statement at issue is "necessary to give life, meaning, and vitality" to the claims. The phrase is "meshed with the ensuing language of the claim" because [*108] it defines the conditions under which the matrix coating is to be employed. Id. Those conditions must be such that the charged groups actually function to bring about a concentration of oppositely-charged ligands that are then covalently bound via the reactive groups. The statement further requires that the quantity of charged groups be that which would bring about a sufficient concentration of biomolecules to produce a useful signal for biosensor purposes. Consequently, the claims can be understood only in the context of this preamble statement, which constitutes a limitation on the claims.

16. With this construction in mind, the court now turns to the issue of infringement.

2. Comparison of the Claims to the Accused Device

17. Claim 4 of the '161 patent depends from claim 3 and, therefore, includes all of the limitations set forth in claims 1-3. (P 42) Accordingly, it is directed to a matrix coating comprising a dextran [*458] hydrogel that is bound to a surface and via which a desired ligand can be bound. (PP 37-42) Said hydrogel is activated to contain charged groups for bringing about a concentration of oppositely-charged ligands and reactive groups for covalently binding [*109] said concentrated ligands to the matrix coating. (P 41) Based on the findings of fact and the court's claim construction, Thermo's CM-dextran cuvette, which is employed in its IASys TM biosensors, falls within the literal scope of claim 4 of the '161 patent. Thermo's CM-dextran cuvette utilizes a three-dimensional matrix suitable for use in a biosensor. (D.I. 96 at 3-4; PP 90-94) Said matrix coating comprises a dextran hydrogel that is attached to the cuvette's surface and via which ligands can be bound. (D.I. 96 at 3-4; PP 93, 105) The dextran hydrogel in Thermo's CM-dextran cuvette is activated to contain charged groups for bringing about a concentration of oppositely-charged biomolecules and reactive groups for covalently binding said concentrated biomolecules. (PP 93, 105) Thus, each

element of claim 4 is present in Thermo's CM-dextran cuvette. The fact that Thermo's process for making the accused cuvette involves first activating unbound dextran and then binding the dextran derivative to the RM surface does not alter this conclusion as claim 4 does not require a particular sequence of steps. (P 93)

18. Claim 5 requires that the charged and reactive groups of the activated dextran [**110] hydrogel of claim 4 be carboxyl groups. (P 42) Claim 5 further requires that some of these carboxyl groups be in the form of one of a particular group of molecular entities of which reactive esters is one. (P 42) Thermo's CM-dextran cuvette contains dextran that has been activated to contain charged and reactive carboxyl groups. (P 93) Some, but not all, of these carboxyl groups are converted into reactive succinimide esters. (P 93) Accordingly, the court concludes that Thermo's CM-dextran cuvette infringes claims 4 and 5 of the '161 patent.

3. Inducing infringement

19. Having found direct infringement, the court now turns to Biacore's contention that Thermo induces infringement of the '161 patent. See *Met-Coil Sys. Corp. v. Korners Unlimited, Inc.*, 803 F.2d 684, 687 (Fed. Cir. 1986) ("Absent direct infringement of the patent claims there can be neither contributory infringement, nor inducement of infringement") (citations omitted). The patent statute provides that "whoever actively induces infringement of a patent shall be liable as an infringer." 35 U.S.C. § 271(b). "A person induces infringement under § 271(b) by actively and knowingly [**111] aiding and abetting another's direct infringement." *C.R. Bard, Inc. v. Advanced Cardiovascular Sys., Inc.*, 911 F.2d 670, 675 (Fed. Cir. 1990). The level of knowledge or intent required is "actual intent to cause the acts which constitute the infringement." *Hewlett-Packard Co. v. Bausch & Lomb, Inc.*, 909 F.2d 1464, 1469 (Fed. Cir. 1990). Although proof of intent is necessary, direct evidence is not required; rather, circumstantial evidence may suffice. See *Moleculon Research Corp. v. CBS, Inc.*, 793 F.2d 1261, 1272 (Fed. Cir. 1986).

20. Biacore argues that Thermo's marketing and sales of its IASys TM biosensor induce the use of the infringing CM-dextran cuvette. (D.I. 111 at 16-17) Specifically, Biacore avers that Thermo induces infringement under § 271(b) by providing its customers with: (1) IASys TM biosensors; (2) instructions for using the CM-dextran cuvettes in the devices; (2) manuals instructing how to

convert some but not all of the carboxyl groups on the CM-dextran to succinimide esters for purposes of electrostatically concentrating ligands into the dextran matrix and covalently binding the ligands so concentrated when the [**112] CM-dextran cuvette is used in the IASys TM biosensor; and (3) application notes and promotional literature demonstrating the benefits and uses of the IASys TM biosensor. (D.I. 111 at 17) Thermo does not refute Biacore's proffer, except to [*459] argue that its CM-dextran cuvette does not literally infringe claims 4 and 5 of the '161 patent.

21. The evidence of record demonstrates that Thermo intended to cause, and caused, its customers to infringe the patent at issue. Thermo actively marketed the infringing CM-dextran cuvette, sold a biosensor system in which the infringing cuvette could be employed, and produced and provided to its customers manuals instructing them to use the cuvette in a manner that infringes claims 4 and 5 of '161 patent. (P 105) While so doing, Thermo was acutely aware of the patent at issue. (P 97) The record further indicates, and the parties do not appear to dispute, that Thermo's customer did employ the cuvettes in a manner consistent with Thermo's instructions. Accordingly, the court finds that Thermo intentionally induced direct infringement of claims 4 and 5 of the '161 patent under § 271(b).

C. Validity

22. "A patent is presumed valid, and the burden [**113] of proving invalidity, whether under § 112 or otherwise, rests with the challenger. Invalidity must be proven by facts supported by clear and convincing evidence." *United States v. Electronics, Inc.*, 857 F.2d 778, 785 (Fed. Cir. 1988). The issue of obviousness is a question of law; however, a determination of obviousness is based on factual inquiries. See, e.g., *In re Goodman*, 11 F.3d 1046, 1049-50 (Fed. Cir. 1993); *B.F. Goodrich Co. v. Aircraft Braking Sys. Corp.*, 72 F.3d 1577, 1582 (Fed. Cir. 1996). Anticipation and the adequacy of the written description, on the other hand, are questions of fact. See, e.g., *Tronzo v. Biomet, Inc.*, 156 F.3d 1154, 1158 (Fed. Cir. 1998); *Glaverbel Societe Anonyme v. Northlake Marketing & Supply, Inc.*, 45 F.3d 1550, 1554 (Fed. Cir. 1995).

1. 35 U.S.C. § 102 -- Anticipation

23. Anticipation is established if every element of a properly construed claim is present in a single prior art

reference. See *id.*; see also *PPG Indus., Inc. v. Guardian Indus. Corp.*, 75 F.3d 1558, 1566 (Fed. Cir. 1996); *Scripps Clinic & Research Found. v. Genentech, Inc.*, 927 F.2d 1565, 1576 (Fed. Cir. 1991). [*114] "There must be no difference between the claimed invention and the reference disclosure, as viewed by a person of ordinary skill in the field of the invention." *Scripps Clinic & Research Found.*, 927 F.2d at 1576.

In determining whether a patented invention is anticipated, the claims are read in the context of the patent specification in which they arise and in which the invention is described. If needed to impart clarity or avoid ambiguity, the prosecution history and the prior art may also be consulted in order to ascertain whether the patentee's invention is novel or was previously known to the art.

Glaverbel Societe Anonyme, 45 F.3d at 1554.

24. Extrinsic evidence has a limited scope in determining anticipation. Although it may be used "to explain the disclosure of a reference," extrinsic evidence is of "limited scope and probative value" since "anticipation requires that all aspects of the claimed invention were already described in a single reference." *Scripps Clinic & Research Found.*, 927 F.2d at 1576. Thus, extrinsic evidence may not be used to "prove facts beyond those disclosed in the reference in order to [*115] meet the claim limitations. The role of extrinsic evidence is to educate the decision-maker to what the reference meant to persons of ordinary skill in the field of the invention" *Id.* Thus, extrinsic evidence of the knowledge of one of ordinary skill in the art is relevant in situations where

the common knowledge of technologists is not recorded in the reference; that is, where technological facts are known to those in the field of the invention, albeit not known to judges.

[*460] 948 F.2d 1264 at 1269. Accordingly, extrinsic evidence may be used to explain but not expand the meaning of a reference. See *In re Baxter Travenol Labs.*, 952 F.2d 388, 390 (Fed. Cir. 1991).

25. Anticipation may be established if a missing claim element, although not explicitly present in the reference, is necessarily inherent in it. See *Atlas Powder Co. v. Ireco Inc.*, 190 F.3d 1342, 1347 (Fed. Cir. 1999). "Under the principles of inherency, if the prior art necessarily functions in accordance with, or includes, the claimed limitations, it anticipates." *Id.* Thus, a "gap in [a] reference may be filled with recourse to extrinsic evidence." *Continental Can Co. USA, Inc. v. Monsanto Co.*, 948 F.2d 1264, 1267-68 (Fed. Cir. 1991). [*116] Such evidence, however, "must make clear that the missing descriptive matter is necessarily present" in the asserted anticipatory reference. *Id.* "Inherency is not necessarily coterminous with the knowledge of those of ordinary skill in the art. Artisans of ordinary skill may not recognize the inherent characteristic or functioning of the prior art." *Mehl Biophile Int'l Corp. v. Milgram*, 192 F.3d 1362, 1999 WT, 782709, at *3 (Fed. Cir. 1999).

26. In the instant action, Thermo argues that, with the exception of claim 5,⁴³ all of the '161 patent claims at issue are anticipated by four separate prior art references, each standing alone: the '470 patent, the Onyezili article, the Mandenius reference, and the Scouten paper. Thermo's anticipation argument, however, rests upon the court's adoption of Thermo's construction of the claims, i.e., that the claims require that the structure disclosed in the '161 patent only be capable of concentrating and covalently binding ligands, not that it be employed under conditions where concentration actually occurs. It is undisputed that none of the asserted anticipatory references teach the use [*117] of charged groups for bringing about a concentration of oppositely-charged biomolecules as required by claims 1 and 15. (PP 48, 51-52, 56-57, 62) Nor do the references inform that ionic concentration should be such that electrostatic concentration can be achieved. (PP 48, 51-52, 56-57, 62) As a result, none of the cited references teach reactive groups that function to covalently bind biomolecules having been electrostatically concentrated. (PP 48, 51-52, 56-57, 62) That the matrix coatings disclosed in the prior art references may, or may not, have incorporated within them charged groups capable of attracting and concentrating oppositely-charged biomolecules under the proper conditions is insufficient to anticipate the claims as the court has construed them.

43 Thermo concedes that the limitations of claim 5 are not fully met by any of the asserted anticipatory references but argues that these

limitations would have been "in the art" at the time of the invention. (D.I. 107 at 840-01, 848-49)

27. The question [**118] then arises whether these claim limitations are inherent in the references' disclosures. As previously noted, a prior art reference may anticipate when the claim limitations, although not explicitly disclosed, are nonetheless inherent in it. See *Mehl/Biophile Int'l Corp.*, 1999 WL 782709, at *3. The Federal Circuit explained the operation of inherency in anticipation as follows:

To serve as an anticipation when the reference is silent about the asserted inherent characteristic, such gap in the reference may be filled with recourse to extrinsic evidence. Such evidence must make clear that the missing descriptive matter is necessarily present in the thing described in the reference In *In re Oelrich*, 666 F.2d 578, 581, 212 U.S.P.Q. 323, 326 (CCPA 1981) (quoting *Hansgirk v. Kemmer*, 26 C.C.P.A. 937, 102 F.2d 212, 214, 40 U.S.P.Q. 665, 667 (CCP1 1939)) provides:

Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient. [Citations omitted]. If, however, the disclosure [**461] is sufficient to show that the [**119] natural result flowing from the operation as taught would result in the performance of the questioned function, it seems to be well settled that the disclosure should be regarded as sufficient.

Continental Can Co., 948 F.2d at 1268-69 (alterations in original); accord *Mehl/Biophile Int'l Corp.*, 1997 WL 782709, at *3; *Finnigan Corp. v. International Trade Commission*, 180 F.3d 1354, 1365 (Fed. Cir. 1999).

28. The structures disclosed in the references cited as anticipatory by Thermo do not function in accordance with the claimed limitations. (PP 48, 51-52, 56-57, 62) Nor are the claimed limitations a necessary consequence of the prior art teachings. An individual utilizing the methods disclosed in the prior art references, therefore, could do so without necessarily employing the conditions required to take advantage of the charged groups, if any, in the matrix coating to concentrate the desired ligands prior to covalent binding. The possibility that conditions allowing for concentration by charge might be utilized by one employing the disclosed procedures is not legally sufficient to show anticipation. See *In re Rijckaert*, 9 F.3d 1531, 1534 (Fed. Cir. 1993); [**120] *In re Oelrich*, 666 F.2d 578, 581 (C.C.P.A. 1981). "Occasional results are not inherent." *Mehl/Biophile Int'l Corp.*, 1999 WL 782709, at *3. Dr. Scouten's conclusory allegations - that it would have been apparent to one of ordinary skill in the art not only that the matrix coatings taught in the prior art references possess charged groups but also the conditions necessary to take advantage of electrostatic concentration prior to covalent binding - are insufficient to establish anticipation. (P 64) These assertions lack the kind of support in the record needed for proof of invalidity by clear and convincing evidence. Moreover, they do not establish that the asserted references "necessarily function" in accordance with the claimed limitations. Accordingly, the '470 patent, the Onyexili article, the Mandenius reference, and the Scouten paper do not disclose every element of the asserted claims. The court concludes that Thermo has failed to prove that claims 1-5, 9-11, and 15 of the '161 patent are invalid for anticipation.

2. 35 U.S.C. § 103 -- Obviousness

29. Thermo contends that claims 1-5, 9-11, and 15 of the '161 patent [**121] are invalid for obviousness under 35 U.S.C. § 103. Specifically, Thermo argues that, when considered in light of the Charged Concentration References, the Onyexili reference or the Mandenius reference in combination with either the Akanuma reference or the Scouten survey article renders the asserted claims obvious.

30. A patent is invalid under 35 U.S.C. § 103

if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

Obviousness under § 103 is a legal conclusion based on several factual inquiries: (1) the scope and content of the prior art; (2) the differences between the claims and the prior art; and (3) the level of ordinary skill in the pertinent art. See *Graham v. John Deere Co.*, 383 U.S. 1, 15 L. Ed. 2d 545, 86 S. Ct. 684 (1966). "Objective evidence such as commercial success, copying, or long-felt need, is relevant, and when present must be considered." *Gilaverhel Societe Anonyme*, 45 F.3d at 1555 [*122] (citing *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 1538-1539 (Fed. Cir. 1983)); see also *B.F. Goodrich Co.*, 72 F.3d at 1582.

31. "The burden of showing, by clear and convincing evidence, the invalidity of the [patent] claims . . . is especially difficult when the prior art was before the PTO examiner during prosecution of the application." *Hewlett-Packard Co.*, 909 F.2d at 1467. Where there is "no PTO view . . . on obviousness in view of [the [*462] asserted] references[,] . . . [the] burden of proof . . . is more easily carried." *EWI Corp. v. Reliance Universal Inc.*, 755 F.2d 898, 905 (Fed. Cir. 1985). At all times, the burden of proof on invalidity remains with the party challenging the patent. See *Hybritech, Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 1375 (Fed. Cir. 1986); *American Hoist & Derrick Co. v. Sowa & Sons, Inc.*, 725 F.2d 1350, 1358 (Fed. Cir. 1984).

32. When obviousness is based on prior art references, "there must be a showing of a suggestion or motivation to modify the teachings" of those references. *B.F. Goodrich Co.*, 72 F.3d at 1582. [*123] This suggestion to modify the art need not be expressly stated in the references; rather, the test is "whether it would have been obvious to select specific teachings and combine them as did the applicant." *In re Dance*, 160 F.3d 1339, 48 U.S.P.Q.2d (BNA) 1635, 1637 (Fed. Cir. 1998). The test is "met by identification of some suggestion, teaching, or motivation in the prior art, arising from what the prior art would have taught a person of ordinary skill in the field of the invention." *Id.*

Hindsight reconstruction and/or "the blueprint drawn by the inventor." *Interconnect Planning Corp. v. Feil*, 774 F.2d 1132, 1138 (Fed. Cir. 1985), may not be used "to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention." *In re Fine*, 837 F.2d 1071, 1075 (Fed. Cir. 1988); see also *Kahn v. General Motors Corp.*, 135 F.3d 1472, 1479 (Fed. Cir. 1998) (stating that "obviousness may not be established using hindsight"). "The question is whether there is something in the prior art as a whole to suggest the desirability, and thus the obviousness, of making the combination." *In re Beattie*, 974 F.2d 1309, 1311 (Fed. Cir. 1992) [*124] (quoting *Lindemann Maschinenfabrik GmbH v. American Hoist & Derrick Co.*, 730 F.2d 1452, 1462 (Fed. Cir. 1984)); accord *In re Fine*, 837 F.2d at 1074-75; *ACS Hosp. Sys., Inc. v. Montefiore Hosp.*, 732 F.2d 1572, 1577 (Fed. Cir. 1984).

33. **Scope and Content of the Prior Art.** A threshold question is whether any or all of the publications identified by Thermo should be characterized as "prior art." Prior art has been defined as "knowledge that is available, including what would be obvious from it, at a given time, to a person of ordinary skill in an art." *Kimberly-Clark Corp. v. Johnson & Johnson*, 745 F.2d 1437, 1453 (Fed. Cir. 1984). The parties do not dispute that all of the references identified by Thermo are within the same field as that of the patented invention and were publicly available more than one year prior to the priority date. (P 44) It is undisputed, therefore, that the asserted references are, in fact, prior art to the '161 patent.

34. **The Differences Between the Claims and the Prior Art.** Once the prior art is identified, the focus of the analysis shifts to identifying the differences between [*125] the claimed invention and the prior art. See *Gardner v. TEC Sys., Inc.*, 725 F.2d 1338, 1345 (Fed. Cir. 1984); *Ryko Mfg. Co. v. Nu-Star, Inc.*, 950 F.2d 714, 717 (Fed. Cir. 1991) ("When analyzing a patent claim for obviousness the claim should be considered as a whole, but the [principal] differences between the [patented] claim and the prior art need to be identified.") Once these differences are ascertained, the analysis centers on the ultimate legal question, "whether these differences are such that the invention as a whole would have been obvious to one of ordinary skill in the art at the time of the invention." *TEC Sys., Inc.*, 725 F.2d at 1345.

35. The question at bar is whether, in light of the

Charged Concentration References, the teachings of either the Onyezili reference or the Mandenius reference when considered with the teachings of the Akanuma reference or the Scouten survey article, show each and every element required by the asserted claims of the '161 patent and suggest the reasonableness of their combination. Based upon the findings of fact, the court concludes [*463] that the references in combination do not render the [*126] claims obvious. Both the Onyezili and Mandenius references instruct the use of an ostensibly inert dextran matrix ⁴⁴ in order to "eliminate" or "bypass" nonspecific binding. (PP 48, 51, 55) Accordingly, these references do not teach (1) the use of charged groups for electrostatically concentrating ligands and (2) reactive groups for covalently binding ligands having been so concentrated. (PP 51-52, 56-57) These deficiencies are not cured by either the Scouten survey article or the Akanuma reference, both of which merely describe activation chemistries capable of imparting onto a hydrogel matrix negatively charged carboxyl groups, some of which are in the form of reactive hydrazides or reactive esters. (PP 65, 66-67) Although these references may teach the incorporation of charged groups into a hydrogel matrix, neither instructs, either alone or in combination with the Onyezili and Mandenius references, the use of those groups to concentrate oppositely-charged biomolecules.

44 That dextran may have a slight, inherent negative charge is irrelevant to the analysis since the researchers who authored these articles employed the polysaccharide expressly believing it would reduce nonspecific binding. Thus, the Onyezili and Mandenius references teach the use of an inert or noncharged matrix.

[**127] 36. On the other hand, the Charged Concentration References do suggest, in the context of affinity-based systems, ⁴⁵ the combination in a matrix coating of charged and reactive groups in order to enhance ligand immobilization. (PP 68-73) There is nothing, however, in the Onyezili and Mandenius references that "fairly suggests" the desirability of the modification to be inferred from the Charged Concentration References and the ability to incorporate that modification via the activation chemistries disclosed in the Scouten survey article and the Akanuma reference. Neither the Onyezili nor the Mandenius reference suggests the benefits of utilizing a charged matrix in the context of a biosensor system. Rather, as noted above,

both references instruct the use of a noncharged, inert matrix in order to avoid nonspecific binding. (PP 51, 55) To that extent, both the Onyezili and Mandenius references "teach away" from the asserted combination of prior art references since "a person of ordinary skill, upon reading the references, would be . . . led in a direction divergent from the path that was taken by the [patentee]." *In re Gurley*, 27 F.3d 551, 553 (Fed. Cir. 1994); [*128] see also *In re Burckel*, 592 F.2d 1175, 1179 (C.C.P.A. 1979).

45 The Crook patent does make reference to the use in a biosensor of a polymeric matrix containing both charged and reactive groups. (DX 540, col. 3, lns. 51-58) Isolated statements in a patent directed to a polymeric matrix having a structure that differs greatly from that claimed in the '161 patent does not constitute proof of motivation to combine. See *In re Fine*, 837 F.2d at 1075; *Interconnect Planning Corp.*, 774 F.2d at 1138.

37. Nor is there any inference in the prior art that a beneficial result would be achieved by such a combination. Nonspecific binding was an obstacle facing researchers attempting to develop a functional biosensor. (P 13) At the time of the invention, the literature concerning affinity chromatography, as well as the Onyezili and Mandenius references, stressed the need for an inert matrix in order to avoid nonspecific adsorption. (PP 51, 55, 78-80) Thus, the prior art warned [*129] against incorporating charged groups in the matrix coating. Thermo's own researchers confirmed this thinking when they expressed concern that the presence of charged carboxyl groups in the dextran matrix would lead to nonspecific binding. (P 91) They did not recognize the beneficial effect of using charged groups in conjunction with reactive groups. (PP 89, 91) Only the '161 patent's disclosure suggests the success to be achieved by such a combination. The absence of evidence indicating that one [*464] skilled in the art ⁴⁶ would be motivated to combine the asserted references to achieve the claimed invention suggests that the combination is nothing more than hindsight reconstruction and, as such, cannot establish obviousness.

46 There are six factors a court should consider in determining the level of ordinary skill in the art: (1) the educational level of the inventor; (2) the type of problems encountered in the art; (3)

the prior art solutions; (4) the rapidity of innovation; (5) the sophistication of the technology at issue; and (6) the educational level of active workers in the field. See *Bausch & Lomb, Inc. v. Barnes-Hind-Hydrocurve, Inc.*, 796 F.2d 443, 449-50 (Fed. Cir. 1986). In the case at bar, the parties disagree as to the focus of the patent at issue. Biacore argues that the '161 patent is directed to biosensors; Thermo, on the other hand, contends that the patent's focus is ligand immobilization.

Consistent with its interpretation of the '161 patent, Thermo argues that one of ordinary skill in the art need not have experience with biosensors. (D.I. 106 at 794-96; D.I. 107 at 886) Thermo concedes, however, that such experience would be useful. (D.I. 106 at 794-96) Specifically, Thermo argues that the person of ordinary skill in the art would have a Ph.D. in organic chemistry or biochemistry with a solid work background in ligand immobilization. (D.I. 106 at 794-96) Biacore does not offer an alternative description of one of skill in the art.

The '161 patent is directed to a matrix coating "suitable for use in a biosensor." Accordingly, for purposes of this action, the court concludes that the person of ordinary skill in the art as of November 10, 1988 would have had a Ph.D. in organic chemistry or biochemistry with a solid work background in ligand immobilization as it relates to biosensor technology.

[**130] 38. **Secondary Considerations.** Objective indicia of nonobviousness must be considered before a conclusion on obviousness is made. See *WMS Gaming Inc. v. International Game Tech.*, 184 F.3d 1339, 1359 (Fed. Cir. 1999); *Hybritech*, 802 F.2d at 1380; *Coble Elec. Prods., Inc. v. Genmark, Inc.*, 770 F.2d 1015, 1026 (Fed. Cir. 1985) (stating that secondary considerations must be considered "always 'not just when the decisionmaker remains in doubt after reviewing the art.'" (quoting *Stratoflex, Inc.*, 713 F.2d at 1539). Such considerations "may be the most probative and cogent evidence in the record. It may often establish that an invention appearing to have been obvious in light of the prior art was not." *Arkie Tures, Inc. v. Gene Larew Tackle, Inc.*, 119 F.3d 953, 957 (Fed. Cir. 1997) (quoting *Stratoflex, Inc.*, 713 F.2d at 1538-39). The patentee bears

the burden of establishing that a nexus exists between the objective evidence offered to show nonobviousness and the merits of the claimed features of the invention. *WMS Gaming Inc.*, 184 F.3d at 1359.

39. In the instant [**131] action, the secondary considerations provide support for a finding that Thermo has failed to carry its burden. After six years of development and research, Biacore's predecessor overcame the salient problems facing biosensor researchers and successfully marketed the first commercially available, real-time, label-free, affinity-based biosensor in 1990, thus satisfying a long recognized need. (P 85) The BiAcore TM system was favorably received and praised by those in the field. (P 86) Even Dr. Davies recognized that the matrix coating claimed in the PCT was "inventive." ⁴⁷ (P 101) For a number of years, Thermo, or its predecessors, also sought to develop an affinity-based biosensor, entering the race in 1987. (P 87) After four years of experimenting with a number of surface materials and chemistries, none of which yielded a surface capable of immobilizing the requisite concentration of ligands, Thermo began utilizing the activated dextran hydrogel matrix set forth in the PCT, ⁴⁸ eventually affixing the [**465] matrix to the RM surface using a methodology equivalent to that set forth in the application. ⁴⁹ (PP 89-94) Thermo's copying of the claimed dextran matrix in light of its failure to [**132] develop an alternative technology despite years of experimentation is indicative of the nonobviousness of the claimed invention.

47 Thermo attempts to discredit Dr. Davies' characterization of the claimed invention, arguing that "it is evident that Dr. Davies must have been unaware of the Charged Concentration References when he wrote these words because these references describe this very feature." (D.I. 116 at 17; D.I. 112 at 32-33) Thermo goes on to question Dr. Davies' status as one of ordinary skill in the art. (D.I. 11 at 17)

48 The record indicates that Dr. Davies conceived the idea of using a hydrogel matrix in May 1990, the same month the PCT application was published, but did not begin experimenting with hydrogels until June 1991.

49 Thermo contends that the PCT claims a dextran hydrogel attached via an X-R-Y monolayer to the metal surface of an SPR biosensor not the CM-dextran hydrogel matrix

per se. Accordingly, Thermo argues that its "copying" of an unclaimed feature is not evidence of nonobviousness." (D.I. 117 at 17; D.I. 112 at 29-31). The court disagrees. See discussion *infra* at Part III.C.3.

[**133] 40. Biacore cites to the commercial success of the BiAcCore TM system in further support of its nonobviousness contention. When a patentee asserts commercial success as evidence of nonobviousness, it bears the burden of establishing a nexus between the proven success and the merits of the invention. See *Demaco Corp. v. F. Von Langsdorff Licensing Ltd.*, 851 F.2d 1387, 1392 (Fed. Cir. 1988). Where, as here, "the thing that is commercially successful is not coextensive with the patented invention—for example, if the patented invention is only a component of a commercially successful machine or process—the patentee must show *prima facie* a legally sufficient relationship between that which is patented and that which is sold." *Id.* If the patentee satisfies this burden, the challenger must demonstrate that the commercial success was due to extraneous factors other than the patented invention. *Id.* at 1392.

41. Thermo contends that Biacore's commercial success is associated with the X-R-Y monolayer disclosed in the PCT and '828 patent, not the claimed invention. (D.I. 112 at 28-29; D.I. 116 at 16-17) This does not explain, however, the fact that [**134] sales of Thermo's dextran cuvettes, like the sale of Biacore's dextran chips, far exceeds the sales of its other cuvettes, none of which employ the X-R-Y monolayer technology. 50 (P 86) Rather, the sales are better explained by the "historic significance" attributed to the CM-dextran matrix as a sensor surface. (D.I. 105 at 550; D.I. 106 at 631-32, 626) Thermo's own advertising describes the CM-dextran cuvettes as the "original sensor surface for biomolecular interactive analysis and hence the most extensively studied and versatile." (D.I. 96 at 3; P 86) Although there are no applications for which CM-dextran is the sole option, its features endow it with advantages that are not met by any other single surface type currently available. (D.I. 169 at 101591; D.I. 105 at 547-48; D.I. 106 at 665; P 106) Moreover, despite Thermo's conclusory allegation that any or all of the patented aspects of Biacore's biosensors may have contributed to their commercial success, it was the dextran matrix that Thermo copied when developing its own IASys TM biosensor. (PP 90-94) Accordingly, the court concludes

that Biacore has demonstrated a nexus between the claimed invention and the commercial success [**135] of its biosensors. Thus, the proven success of the BiAcCore TM system weighs in favor of a finding of nonobviousness.

50 The fact that CM-dextran cuvettes are not reusable generally to the same degree as are other types of cuvettes manufactured by Thermo does not account for the large discrepancy in sales. (D.I. 105 at 548; D.I. 106 at 638-41, 642-43)

42. In light of the test set out in *Graham*, the court concludes, after examining the prior art and secondary considerations of nonobviousness, that Thermo has failed to prove by clear and convincing evidence that the '161 patent is invalid on obviousness grounds. The claimed invention is several steps removed from the information presented in the prior art references.

3. 35 U.S.C. § 112

43. The Patent Act requires that a patent specification contain (1) an enabling disclosure; (2) a sufficient written description [**466] of the claimed invention; and (3) a disclosure of the best mode of carrying out the invention. The relevant statutory [**136] language appears in the first paragraph of § 112 of the Patent Act:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.

44. **Written Description.** For a later-filed patent to be entitled to the filing date of an earlier patent, the disclosure of the earlier patent must comply with the written description requirement. See *Lockwood v. American Airlines, Inc.*, 107 F.3d 1565, 1572-73 (Fed. Cir. 1997). To satisfy this requirement, the disclosure of the earlier-filed application "must reasonably convey to one of skill in the art that the inventor possessed the later-claimed subject matter at the time the patent

application was filed." *Tronzo*, 156 F.3d at 1158; see also *Vas-Cath Inc. v. Mahurkar*, 935 F.2d 1555, 1563-64 (Fed. Cir. 1991) (stating that the written description requirement [**137] is "broader than to merely explain how to 'make and use'; the applicant must also convey with reasonable clarity to those skilled in the art that, as of the filing date sought, he or she was in possession of **the invention**." (emphasis in original)); *Hoechst Celanese Corp. v. BP Chemis. Ltd.*, 844 F. Supp. 336, 340 (S.D. Tex. 1994) ("The test for the written description requirement is not whether a skilled artisan **would have known** that lithium iodide was 'suitable' in similar processes; the test is whether the artisan would have known, from reading the description, that the **inventor** of the '73 application **did know** of this suitability--and hence had possession of this invention." (emphasis in original)). For possession to be demonstrated, a disclosure must "describe the invention[] with all its claimed limitations." *Lockwood*, 107 F.3d at 1572.

While the meaning of terms, phrases, or diagrams in a disclosure is to be explained or interpreted from the vantage point of one skilled in the art, all the limitations must appear in the specification. The question is not whether a claimed invention is an obvious variant of that [**138] which is disclosed in the specification. Rather, a prior application itself must describe an invention, and do so in sufficient detail that one skilled in the art can clearly conclude that the inventor invented the claimed invention as of the filing date sought.

Id.; see also *In re Alton*, 76 F.3d 1168, 1172 (Fed. Cir. 1996) (stating that in order to satisfy the written description requirement a patent must "clearly allow persons of ordinary skill in the art to recognize that [the patentee] invented what is claimed." (quoting *In re Gosteli*, 872 F.2d 1008, 1012 (Fed. Cir. 1989))). The claimed invention, however, need not be described in *ipsis verbis* in order to satisfy the written description requirement. See *Application of Lukach*, 58 C.C.P.A. 1233, 442 F.2d 967, 969 (C.C.P.A. 1971).

45. The written description requirement is separate and distinct from the enablement requirement. See *Vas-Cath Inc.*, 935 F.2d at 1563-64. A specification that enables the practice of an invention as broadly as it is

claimed necessarily need not describe the claimed invention. See *id.* at 1561. As the Federal [**139] Circuit's predecessor court, the Court of Customs and Patent Appeals ("CCPA"), explained:

Where the specification discusses **only** compound A and contains **no** broadening language of any kind . . . this might very well enable one skilled in the art to make and use compounds B and C; yet the class consisting of A, B, and C has not been described.

Application of DiLeone, 58 C.C.P.A. 925, 436 F.2d 1404, 1405 n.1 (C.C.P.A. 1971) (emphasis in original). "That a person skilled in the [**467] art might realize from reading the disclosure that such a step is **possible** is not sufficient indication to that person that the step is part of the applicant's invention." *In re Winkhaus*, 527 F.2d 637, 640 (C.C.P.A. 1975) (emphasis in original). This does not mean, however, that a claimed invention cannot broaden the literal aspects of an earlier-filed application. In this regard, the CCPA in *In re Smythe*, 480 F.2d 1376 (C.C.P.A. 1973) posed the following hypothetical:

If the original specification of a patent application on the scales of justice disclosed only a 1-pound "lead weight" as a counterbalance to determine the weight of a pound [**140] of flesh, we do not believe the applicant should be prevented, by the so-called "description requirement" of the first paragraph of § 112, or the prohibition against new matter of § 132, from later claiming the counterbalance as a "metal weight" or simply as a 1-pound "weight," although both "metal weight" and "weight" would indeed be progressively broader than "lead weight," including even such an undisclosed, but obviously art-recognized equivalent, "weight" as a pound of feathers. The broader claim language would be permitted because the description of the use and function of the lead weight as a scale counterbalance in the whole disclosure would immediately convey to any person skilled in the scale art the knowledge that the applicant invented a scale with a 1-pound counterbalance weight, regardless of its composition.

Id. at 1384.

46. Likewise, the CCPA recognized "a subtle distinction between a written description adequate to support a claim under § 112 and a written description sufficient to anticipate its subject matter under § 102(b)." *Vas-Cath, Inc.*, 935 F.2d at 1562 (emphasis in original) (citing *Application of Lukach*, 58 C.C.P.A. 1233, 442 F.2d 967). [*141] In *Application of Lukach*, the CCPA found that the patent application at issue was not entitled to the filing date of the grandparent application as the earlier filing did not sufficiently describe the later-claimed invention, but that the British counterpart to the grandparent application anticipated the claimed subject matter. See *Application of Lukach*, 442 F.2d at 969. The CCPA stated in this regard that

the description of a single embodiment of broadly claimed subject matter constitutes a description of the invention for anticipation purposes (see, e.g., *In re Ruscetta*, 255 F.2d 687, 45 C.C.P.A. 968 (1958)), whereas the same information in a specification might not alone be enough to provide a description of that invention for purposes of adequate disclosure.

442 F.2d at 970. Accordingly, a parent or grandparent application's disclosure can be prior art against, and anticipate the claims of, a later-filed application containing broader claims while still not describing the claimed invention so as to allow the later-claimed invention to assert the parent's filing date. See, e.g., *Application of DiLeone*, 436 F.2d at 1405-06; [*142] *In re Ahlbrecht*, 58 C.C.P.A. 848, 435 F.2d 908, 910-12 (C.C.P.A. 1971); *In re Ruscetta*, 45 C.C.P.A. 968, 255 F.2d 687; see also *Chester v. Miller*, 906 F.2d 1574, 1577 (Fed. Cir. 1990); *In re Gosteli*, 872 F.2d 1008 (Fed. Cir. 1989); *Application of Lukach*, 442 F.2d at 968-70.

47. Compliance with the written description requirement is a question of fact that must be determined on a case-by-case basis. See *Vas-Cath Inc.*, 935 F.2d at 1562; *In re Wertheim*, 541 F.2d 257, 262 (C.C.P.A. 1976) ("the primary consideration is factual and depends on the nature of the invention and the amount of knowledge imparted to those skilled in the art by the disclosure."). In order to succeed, a challenger must provide clear and convincing evidence that persons skilled in the art would

not recognize in the disclosure a description of the claimed invention. See *In re Alton*, 76 F.3d at 1175.

Thermo contends that the '828 *potent*'s specification does not provide sufficient [*146] support for the broad claims of the '161 *potent* and, thus, the claims are entitled only to a filing date [*143] of May 10, 1993. As such, Thermo argues, the claims of the '161 *potent* are anticipated by the PCT. The question at bar, therefore, is whether Thermo has provided clear and convincing evidence that persons skilled in the art would not recognize that the patentees had possession of the claimed invention as of November 10, 1988.

48. Thermo argues that the specification of the '828 *potent* does not disclose the invention's applicability to nonmetal surfaces and/or to hydrogels bound directly to the underlying surface. (D.I. 112 at 33-39) It is axiomatic that the claims of a patent may be broader than the specific embodiment disclosed in the specification. See, e.g., *In re Peters*, 723 F.2d 891, 893 (Fed. Cir. 1983). Thus, that the written description of the '828 *potent* repeatedly refers to metal surfaces, lacks an example of a hydrogel attached to a nonmetal surface, and provides a preferred embodiment in which a hydrogel is bound to a metal surface via an X-R-Y monolayer is not, in and of itself, dispositive. Likewise, the fact that, during prosecution of the '828 *potent*, the applicants distinguished the prior art in part on the presence in the claimed invention of a densely [*144] packed X-R-Y monolayer and discussed in the specification the limitations inherent in a particular method of attaching an organic polymer directly to a metal biosensor surface, does not render the written description insufficient on its face. Rather, the focus is on whether a skilled artisan reading the description of the '828 *potent* would conclude that the inventors knew the hydrogel matrix disclosed was suitable for use on both metal and nonmetal surfaces and could be directly attached thereto. As to that issue, Thermo's expert offered no opinion.

49. Reading the specification in light of what the '161 *potent* claims state and considering it against the background of the prior art, the court finds that Thermo has failed to carry its burden. The essence of the original disclosure is a sensing surface suitable for use in a biosensor comprised of a bound and activated, three-dimensional hydrogel matrix that is capable of selectively coupling the desired ligands.⁵¹ The written description details the hydrogel matrix's versatility and

notes its applicability to a variety of types of biosensors, not just those employing metal surfaces.⁵² (see, e.g., PX 4, col. 1, lns. 16-20, 40; [*145] col. 3, lns. 13-15, 22-25, 40-45; col. 4, lns. 8-13; col. 5, lns. 29-41; col. 8, lns. 31-36) In fact, the record indicates that Thermo's researchers copied the matrix coating disclosed in the PCT because they recognized it would work for the purposes they intended, i.e., in a biosensor employing a nonmetal surface, and attached it to the RM surface using known surface chemistries. (P 90) Moreover, the use of the disclosed matrix to increase "liquid density per area unit" and its functionalization to electrostatically concentrate and covalently bind ligands, thereby enhancing the measuring signal, is well documented in the specification. (see, e.g., PX 4, col. 5, lns. 29-41; col. 6, lns. 33-35, 43-51) Furthermore, during the relevant time period, the use of hydrogels in biosensors generally and the means of attaching them to metal, as well as nonmetal surfaces, was well known. (PP 75-76) Given this understanding and the description of the use and function of the hydrogel matrix in the disclosure, the court concludes that Thermo has failed to prove by clear and convincing evidence that the disclosure does not convey [*469] to persons skilled in the art that the patentees had possession [*146] of the claimed invention at the time the application was filed.

51 Although the disclosure and claims teach that the desired ligands may be bound directly to the X-R-Y monolayer, the majority of the specification as well as the preferred embodiment and the claims are directed to the binding of ligands by an activated hydrogel matrix coupled to an X-R-Y monolayer.

52 SPR technology itself is not limited to metal surfaces. (PX 39: "Surface plasmons exist in the boundary of a solid (metal or semi conductor) whose electrons behave like those of a quasi-free electron gas.")

50. In sum, the court concludes that Thermo has not carried its burden that the asserted claims of the '161 patent are invalid.

IV. DAMAGES

1. Based on the foregoing, it is the court's conclusion that Thermo infringes claims 4 and 5 of the '161 patent. Accordingly, Biacore is entitled to relief for Thermo's infringement. Biacore asserts that it is entitled to lost profit damages, enhanced damages, prejudgment interest,

attorneys' [*147] fees, and injunctive relief.

A. Lost Profit Damages

2. The standard for damages for patent infringement is set forth in 35 U.S.C. § 284. Section 284 provides that a patent owner whose patent has been infringed is entitled to "damages adequate to compensate for the infringement, but in no event less than a reasonable royalty for the use made of the invention by the infringer, together with the interests and costs as fixed by the court." Damages for infringement have been broadly defined as the "difference between the patentee's pecuniary condition after the infringement, and what [the patentee's] condition would have been if infringement had not occurred." *King Instruments Corp. v. Perego*, 65 F.3d 941, 948 (Fed. Cir. 1995). The reasonable royalty provision in the statute provides the "floor below which damage awards may not fall." *Rite-Hite Corp. v. Kelley Co.*, 56 F.3d 1538, 1544 (Fed. Cir. 1995).

3. In the instant action, Biacore seeks lost profits damages. In order to be entitled to lost profits, as opposed to royalties, a patentee must show a reasonable probability that it would have made sales of the infringing [*148] product "but for" the infringement. See *Rite-Hite*, 56 F.3d at 1545; *BIC Leisure Prods. v. Windsurfing Int'l Inc.*, 1 F.3d 1214, 1218 (Fed. Cir. 1993). Thus, a patent owner is not required to demonstrate causation with absolute certainty. See *Kaufman Co. v. Lantech, Inc.*, 926 F.2d 1136, 1141 (Fed. Cir. 1991) ("A patentee need not negative every possibility that the purchaser might not have bought another product other than his absent the infringement.").

4. A patentee can show "but for" causation by means of the four-factor test set forth in *Panduit Corp. v. Stahlman Bros. Fibre Works, Inc.*, 575 F.2d 1152 (6th Cir. 1978), though this is not an exclusive means for showing entitlement to lost profits damages. See *Rite-Hite*, 56 F.3d at 1545. The Panduit test requires a patentee to show (1) demand for the patented product, (2) the absence of acceptable noninfringing alternatives, (3) the marketing and manufacturing capability to exploit the demand, and (4) the amount of profit it would have made but for the infringement. See *Panduit Corp.*, 575 F.2d at 1156. Satisfaction of these factors [*149] allows the court to reasonably infer that the claimed lost profits were caused by the infringing sales. See *Rite-Hite*, 56 F.3d at 1545. The same inference is possible upon a showing that the patentee and the infringer are the only suppliers

present in the market. See *Kaufman Co.*, 926 F.2d at 1141. "Consequently, when the fact situation compels the reasonableness of the inference via both courses, the inference approaches conclusiveness." Id. Once the patentee establishes the reasonableness of the inference, the burden "shifts to the infringer to show that the inference is unreasonable for some or all of the lost sales." *Rite-Hite*, 56 F.3d at 1545.

5. The first factor of the Panduit test presupposes that the demand for the patentee's product and the infringer's product is interchangeable. See *BIC Leisure Prods.*, 1 F.3d at 1218. This factor requires, therefore, that the patent owner and the infringer sell substantially the same product. See *id.* at 1219. "If the products are not sufficiently similar to [§470] compete in the same market for the same customers, the infringer's customers would not necessarily [§470] transfer their demand to the patent owner's product in the absence of the infringer's product." Id.

6. Similarly, the second Panduit factor assumes that the patentee and the infringer sell substantially similar products in the same market. See *id.* This factor requires that any proffered alternative compete in the same market for the same customer as the infringer's product. See *id.* In order for an alleged alternative to be acceptable to an infringer's customers, it "must not have a disparately higher price than or possess characteristics significantly different from the patented product." Id. (quoting *Kaufman Co.*, 926 F.2d at 1142).

A product on the market which lacks the advantages of the patented product can hardly be termed a substitute acceptable to the customer who wants those advantages. Accordingly, if purchasers are motivated to purchase because of particular features available only from the patented product, products without such features—even if otherwise competing in the marketplace—would not be acceptable noninfringing substitutes.

Standard Havens Prods., Inc. v. Gencor Indus., 953 F.2d 1360, 1373 (Fed. Cir. 1992). [§470] An acceptable alternative, however, need not possess all of the features of the patented invention as it is not required to "represent an embodiment of the invention." *Smithkline Diagnostics v. Helena Labs.*, 926 F.2d 1161, 1166 (Fed.

Cir. 1991). Thus, proof that there are no acceptable noninfringing alternatives requires a showing either that "(1) the purchasers in the market place generally were willing to buy the patented product for its advantages, or (2) the specific purchasers of the infringing product purchased on that basis." Id.

7. Where, as here, the patentee seeks damages on components sold with a patented apparatus, the "entire market value rule" is applied. See *Rite-Hite*, 56 F.3d at 1549. This rule "permits recovery of damages based on the value of a patentee's entire apparatus containing several features when the patent-related feature is the 'basis for customer demand.'" Id. The entire market rule is applicable where

the patented and unpatented components together are "analogous to components of a single assembly," "parts of a complete machine," or "constitute a functional unit," but not where the unpatented components [§470] "have essentially no functional relationship to the patented invention and . . . may have been sold with an infringing device only as a matter of convenience or business advantage."

Tec Air, Inc. v. Denso Mfg. Michigan Inc., 192 F.3d 1353, 1362 (Fed. Cir. 1999).

8. In the case at bar, it is undisputed that demand exists for both the BiAcure TM and the iAsys TM biosensors. It is equally undisputed that Thermo and Biacore are the only suppliers of optical biosensors capable of performing real-time, label-free kinetic measurements. Although other analytical instruments capable of measuring biomolecular interactions are commercially available, none are capable of performing the range of functions of the BiAcure TM and iAsys TM devices. Thus, the market for optical biosensors of this nature is composed of two suppliers.

9. The patented and unpatented component parts of the BiAcure TM and iAsys TM biosensor systems, respectively, in combination "constitute a functional unit." Those parts, specifically Thermo's CM-dextran cuvette and Biacore's patented dextran chip, however, are not interchangeable between units. The CM-dextran cuvette is suitable for use only in [§470] the iAsys TM system while the Biacore dextran chip can be used only

in a BIAcore™ biosensor. (P 93) Thus, the cuvette and the chip cannot be substituted one for the other. Accordingly, sales of the cuvette and the chip are linked to the sales of their respective biosensor systems, which are not equivalent. Among other differences, [*471] the BIAcore™ system is far more expensive than the IAsys™ system, it employs a "rapid flow" system rather than a "vibroster" as is found in the IAsys™ biosensor, it is unable because of limitations imposed by the flow system capillaries to analyze whole cells, and it has a smaller active surface on its chip than the IAsys™ does in its cuvette. (D.I. 103 at 120, 134-39; D.I. 508, 529-31, 557-585, 60-62; DX 979; DX 988; PP 84-85, 102) Moreover, the IAsys™ biosensor is fully operable and functions without the CM-dextran cuvette as other types of cuvettes are available. (P 106) Given these differences, the court concludes that Biacore has not met its burden. Although the evidence of record establishes a nexus between the sale of the BIAcore™ and IAsys™ TM biosensors and the dextran matrix claimed in the '161 patent, it is insufficient to establish [*154] the claimed matrix as the "basis for customer demand." 53

53 Biacore argues that Thermo's admissions made in opposition to Biacore's request for a preliminary injunction judicially estop Thermo from now arguing that demand for the CM-dextran cuvette is not probative of demand for the patented product. (D.I. 111 at 27-28; D.I. 117 at 13) Review of the record, however, reveals that Thermo's arguments as to the motion for preliminary injunction are not inconsistent with its current position.

10. The evidence of record also demonstrates that there is no molecular interaction measurable by the IAsys™ system for which the CM-dextran matrix is the sole option. (P 106) While the CM-dextran matrix may be more versatile than the other available surfaces, one or more of the nondextran cuvettes are suitable for every application for which customers use the CM-dextran cuvette. (P 106) Thus, these cuvettes are acceptable alternatives to the patented invention. In light of the aforementioned differences between the biosensor [*155] systems at issue, Biacore has failed to demonstrate there was a reasonable probability that a customer, when faced with a choice between a BIAcore™ TM system with a dextran chip and a Thermo system sporting an applicable nondextran cuvette, would have chosen the BIAcore™ TM system. See *Smithkline*

Diagnostics, 926 F.2d at 1166 ("If the realities of the market are that others would likely have captured sales made by the infringer, despite a difference in the products, it follows that the 'but for' test is not met."). Accordingly, the court concludes that Biacore has failed to prove by a preponderance of the evidence that it would have made Thermo's sales had there been no infringement. 54 Having so found, a determination of damages based upon a reasonable royalty is required. 55 See *Water Techs. Corp. v. Calco, Ltd.*, 850 F.2d 660, 673-74 (Fed. Cir. 1988).

54 The court's finding that Biacore demonstrated a nexus between its sales of the BIAcore™ TM system and its dextran chip is not inconsistent with this conclusion. That Biacore's sales of its biosensor system might be linked to its patented dextran matrix does not establish an entitlement to lost profits damages.

[**156]

55 Based on the briefing before it, the court declines at this juncture to address the calculation of a reasonable royalty. The court also will defer discussion of prejudgment interest until such time as it rules on the issue of reasonable royalty.

B. Enhanced Damages—Willful Infringement

11. Biacore contends that Thermo willfully infringed the '161 patent, warranting enhanced damages and attorneys' fees. Pursuant to § 284, a court may in its discretion "increase the damages up to three times the amount found or assessed." The Federal Circuit has set forth a two-step analysis a court should employ in exercising its discretion:

First, the fact-finder must determine whether an infringer is guilty of conduct upon which increased damages may be based. If so, the court then determines, exercising its sound discretion, whether, and to what extent, to increase the damages award given the totality of the circumstances.

[*472] *Jurgens v. CBK, Ltd.*, 80 F.3d 1566, 1570 (Fed. Cir. 1996). In evaluating the egregiousness of an infringer's conduct the court must consider [*157] factors that render the infringer's conduct more culpable as well as factors that are mitigating or ameliorating. See

Read Corp. v. Portec, Inc., 970 F.2d 816, 826 (Fed. Cir. 1992); *SRI Int'l v. Advanced Tech. Labs., Inc.*, 127 F.3d 1462, 1468-69 (Fed. Cir. 1997). Factors the court may take into consideration when determining whether and to what extent to exercise its discretion include:

(1) whether the infringer deliberately copied the ideas or design of another, (2) whether the infringer, when he knew of the other's patent protection, investigated the scope of the patent and formed a good-faith belief that it was invalid or that it was not infringed, (3) the infringer's behavior as a party to the litigation, (4) the infringer's size and financial condition, (5) the closeness of the case, (6) the duration of the infringer's misconduct, (7) any remedial action by the infringer, (8) the infringer's motivation for harm, and (9) whether the infringer attempted to conceal its misconduct.

Johns Hopkins Univ. v. CellPro, Inc., 152 F.3d 1342, 1352 n.16 (Fed. Cir. 1998). The ultimate question remains, however, "whether the infringer, [*158] acting in good faith and upon due inquiry, had sound reason to believe that it had the right to act in the manner that was found to be infringing." *SRI Int'l*, 127 F.3d at 1464-65. In the instant action, Biacore bears the burden of proving by clear and convincing evidence that Thermo acted willfully in infringing the '161 patent. See *id.* at 1465.

12. It is undisputed that Thermo had knowledge of the PCT when it developed and began marketing its IAsys TM biosensor. (P 88) It also is undisputed that the '265 continuation application, which broadened the claims of the '828 patent, was not filed until two months after Thermo gave its first public demonstration of the IAsys TM biosensor at a meeting attended by Biacore representatives. (PP 29, 94-95) The record also establishes that the IAsys TM biosensor had been sold in the United States for over a year before the '161 patent, with its broadened claims, issued and that Thermo became aware of the patent no later than September 7, 1995. (P 97)

13. Actual notice of another's patent rights imposes an affirmative duty of due care upon the potential infringer to avoid infringement. *Electro Med. Sys., S.L. v. Cooper Life Sciences, Inc.*, 34 F.3d 1048, 1056 (Fed. Cir.

1994). [*159] This duty generally includes "seeking and obtaining competent legal advice before engaging in activity that may result in infringement." *Id.* There is, however, no "absolute requirement that a would-be defendant aware of another's patent obtain its own opinion letter in order to immunize itself from a finding of willful infringement." *Hall v. Aqua Queen Affg., Inc.*, 93 F.3d 1548, 1555 (Fed. Cir. 1996). The Federal Circuit has held, however, "that when an infringer refuses to produce an exculpatory opinion of counsel in response to a charge of willful infringement, an inference may be drawn that either no opinion was obtained or, if an opinion was obtained, it was unfavorable." *Electro Med. Sys.*, 34 F.3d at 1056. Nevertheless, such an inference "does not foreclose consideration of other relevant factors. Possession of a favorable opinion of counsel is not essential to avoid a willfulness determination; it is only one factor to be considered, albeit an important one." *Id.*

14. Based upon its review of the totality of the circumstances, the court concludes that Biacore has not satisfied its burden of establishing by clear and convincing evidence [*160] that Thermo willfully infringed the '161 patent. The evidence of record indicates that prior to the issuance of the '161 patent Thermo copied the hydrogel matrix, but not the X-R-Y technology, disclosed in the PCT. (P 93) Thermo made no attempt to conceal from Biacore's predecessor that it had done so, and Biacore never accused Thermo of infringing [*473] the PCT or its U.S. counterpart, the '828 patent. The record further reveals that once Thermo became aware of the '161 patent it investigated the scope of the patent as well as its validity but made no attempt to redesign its CM-dextran cuvette in order to avoid infringement. (PP 97-100)

15. As noted, Thermo's failure to provide an exculpatory opinion of counsel despite the fact that it sought legal advice from two separate sources is an important factor to consider but is not dispositive. (P 99) Although Thermo stipulated that it "does not assert that it had a good-faith belief that the '161 patent was not infringed, invalid or unenforceable[.]" (D.I. 96 at 5), the evidence at bar indicates that the validity of the '161 patent was a close case.⁵⁶ The claims of the '161 patent embrace a hydrogel bound by any means to any type of surface [*161] while the grandparent application is drawn to a hydrogel bound to a metal surface by an X-R-Y monolayer. (P 23-28, 33-43) As evidenced by the

voluminous record. Thermo put on a substantial challenge as to whether the generic claims of the '161 patent were obvious or anticipated by the prior art as well as whether the written description of the '828 patent was sufficient to support these broadened claims. Accordingly, the court concludes that Biacore is not entitled to an enhanced damages award.

56 Biacore contends that in submitting verbatim the claims of the '161 patent as part of its own patent application, Thermo "expressed its belief that the claimed subject matter was patentable over the prior art." (D.I. 111 at 37) Thermo, however, indicated in the amendment to the PTO containing the claims that the claims had been copied from the '161 patent. Thus, the record indicates that Thermo was attempting to provoke an interference action challenging the validity of the '161 patent claims despite the fact that it did not explicitly so state to the examiner.

[**162] 16. Likewise, the court declines to find that this case is an "exceptional case" under 35 U.S.C. § 285. Section 285 provides that "in exceptional cases [the court] may award reasonable attorney fees to the prevailing party." The purpose of this section is to compensate "the prevailing party for its monetary outlays in prosecution or defense of a suit where the conduct of the losing party is clearly inequitable." *Multi-Tech, Inc. v. Components, Inc.*, 708 F. Supp. 615, 620 (D. Del. 1989). In determining whether to award attorneys' fees, the Federal Circuit teaches that the court must first determine whether the case is exceptional; if it is, then it is within the court's discretion to award reasonable attorneys' fees to the prevailing party. See *J.P. Stevens Co. v. Lex Tex Ltd.*, 822 F.2d 1047, 1050 (Fed. Cir. 1987); *Machinery Corp. of America v. Gulf Fiber AB*, 774 F.2d 467, 470 (Fed. Cir. 1985). In general, for a case to be deemed exceptional there must be some finding, by clear and convincing evidence, of willful infringement, inequitable conduct before the PTO, misconduct during the litigation, vexatious or [**163] unjustified litigation or some similar exceptional circumstances. See *Advance Transformer Co. v. Levinson*, 837 F.2d 1081, 1085 (Fed. Cir. 1988); *Standard Oil Co. v. American Cyanamid Co.*, 774 F.2d 448, 455 (Fed. Cir. 1985); *Stevenson v. Sears, Roebuck & Co.*, 713 F.2d 705, 713 (Fed. Cir. 1983). In the instant action, the court concludes that Biacore has

not satisfied its burden of establishing by clear and convincing evidence that Thermo's actions make this case an exceptional one. Accordingly, the court shall deny Biacore's request for attorneys' fees.

C. Injunctive Relief

17. Biacore seeks a permanent injunction enjoining Thermo from infringing the '161 patent. Pursuant to 35 U.S.C. § 283, this court is authorized to "grant injunctions in accordance with the principles of equity to prevent the violation of any right secured by patent, on such terms as the court deems reasonable." The court is not required to enter an injunction when infringement has been determined. See, e.g., *W.L. Gore & Assocs.*, [**474] *Inc. v. Garlock, Inc.*, 842 F.2d 1275, 1281 (Fed. Cir. 1988). Rather, a court has broad [**164] discretion in deciding whether to grant an injunction and in determining the scope of an injunction. See *Joy Techs. Inc. v. Flakt, Inc.*, 6 F.3d 770, 772 (Fed. Cir. 1993). As a general rule, however, "an injunction will issue when infringement has been adjudged, absent a sound reason for denying it." *Richardson v. Suzuki Motor Co., Ltd.*, 868 F.2d 1226, 1247 (Fed. Cir. 1989). That the injunction might put the infringer out of business does not justify denial of the injunction. See *Windsurfing Int'l, Inc. v. AMP, Inc.*, 782 F.2d 995, 1003 n.12 (Fed. Cir. 1986). In the instant action, there is no sound reason for denying an injunction. Accordingly, the court will grant a permanent injunction preventing Thermo from infringing the '161 patent.

V. CONCLUSION

For the reasons discussed, the court finds that in making, selling, and using IAsys TM biosensors employing a CM-dextran cuvette defendant Thermo has infringed, and induced infringement of, claims 4 and 5 of the '161 patent in violation of 35 U.S.C. § 271. Further, the court finds the '161 patent valid and enforceable under 35 U.S.C. §§ 102, [**165] 103, and 112. As a result of finding infringement, Biacore is entitled to a permanent injunction preventing Thermo from infringing claims 4 and 5 of the '161 patent. In addition, Biacore is entitled to money damages to be calculated based upon a reasonable royalty. Judgment shall be entered accordingly.

LEXSEE 948 F.2D 1264

**CONTINENTAL CAN COMPANY USA, INC. and CONTINENTAL PET
TECHNOLOGIES, INC., Plaintiffs-Appellants, v. MONSANTO COMPANY,
HOOVER UNIVERSAL, INC. and JOHNSON CONTROLS, INC.,
Defendants-Appellees**

No. 90-1328

UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

948 F.2d 1264; 1991 U.S. App. LEXIS 26994; 20 U.S.P.Q.2D (BNA) 1746

November 13, 1991, Decided

SUBSEQUENT HISTORY: Rehearing Denied
December 26, 1991, Reported at: 1991 U.S. App. LEXIS
29979.

PRIOR HISTORY: [**1] Appealed from: U.S.
District Court for the Southern District of Ohio; Judge
Spiegel.

DISPOSITION: Reversed in Part, Vacated in Part, and
Remanded.

COUNSEL: Eugene F. Friedman, Eugene F. Friedman,
Ltd., of Chicago, Illinois, argued for
Plaintiffs-Appellants. With him on the brief were Edwin
C. Thomas, III and David M. Novak, Bell, Boyd &
Lloyd, of Chicago, Illinois. Also on the brief was Kurt L.
Grossman, Wood, Herron & Evans, of Cincinnati, Ohio.

Henry J. Renk, Fitzpatrick, Cella, Harper & Scinto, of
New York, New York, argued for Defendants-Appellees.
With him on the brief were Lawrence F. Scinto and
Bruce C. Haas. Also on the brief were Jacob K. Stein,
Deborah DeLong, Thompson, Hinc & Flory, of
Cincinnati, Ohio, Lawrence L. Limpus, Monsanto
Company, of St. Louis, Missouri and Edward L. Levine,
Johnson Controls, Inc., of Milwaukee, Wisconsin.

JUDGES: Newman, Archer, and Rader, Circuit Judges.

OPINION BY: NEWMAN

OPINION

[*1265] NEWMAN, Circuit Judge

Continental Can Company USA and Continental
PET Technologies (collectively "Continental") appeal the
partial summary judgment of the United States District
Court for the Southern District of Ohio, holding that
United States Patent No. 4,108,324 (the Conobase or
*324 [*2] patent)* is invalid. ¹ Final judgment was
entered on this issue, for the purpose of appeal.

1 *Continental Can Co. USA v. Monsanto Co.*,
1989 U.S. Dist. LEXIS 13417, 11 U.S.P.Q.2d
(BNA) 1761 (S.D. Ohio 1989), *reconsid. denied*,
No. C-1-86-1213 (S.D. Ohio Nov. 9, 1989).

Summary Judgment

An issue may be decided on motion for summary
judgment when there is no genuine issue of material fact,
and the movant is entitled to judgment as a matter of law.
Fed. R. Civ. P. 56(c); Anderson v. Liberty Lobby, Inc.,
477 U.S. 242, 91 L. Ed. 2d 202, 106 S. Ct. 2505 (1986);
Celotex Corp. v. Catrett, 477 U.S. 317, 325-26, 91 L. Ed.
2d 265, 106 S. Ct. 2548 (1986); *Scripps Clinic &
Research Foundation v. Genentech, Inc.*, 927 F.2d 1565,
1571, 18 U.S.P.Q.2d (BNA) 1001, 1005 (Fed. Cir. 1991).
The movant's burden is to show that no fact material to
the issue is in dispute, that even if all material factual
inferences are drawn in favor of the non-movant the
movant is entitled to judgment as a matter of law. *Id.*
Summary judgment is as available in patent cases [*3]
as in other areas of litigation. *Chore-Time Equipment,
Inc. v. Cumberland Corp.*, 713 F.2d 774, 778-79, 218
U.S.P.Q. (BNA) 673, 675 (Fed. Cir. 1983)

The purpose of the summary process is to avoid a clearly unnecessary trial, *Matsushita Elec. Industrial Co. v. Zenith Radio Corp.*, 475 U.S. 574, 587, 89 L. Ed. 2d 538, 106 S. Ct. 1348 (1986); it is not designed to substitute lawyers' advocacy for evidence, or affidavits for examination before the fact-finder, when there is a genuine issue for trial. As stated in *Adickes v. S.H. Kress & Co.*, 398 U.S. 144, 176, 26 L. Ed. 2d 142, 90 S. Ct. 1598 (1970) (Black, J., concurring), "the right to confront, cross-examine and impeach adverse witnesses is one of the most fundamental rights sought to be preserved by the Seventh Amendment". See also *Poller v. Columbia Broadcasting System, Inc.*, 368 U.S. 464, 473, 71 L. Ed. 2d 458, 82 S. Ct. 486 (1962).

While facilitating the disposition of legally meritless suits, when summary judgment [*1266] is inappropriately granted the effect is to prolong litigation and increase its burdens. This is of particular concern in patent disputes, where the patent property is a wasting asset, and justice is ill served by delay in final resolution. [**4] In the case at bar, although some issues could be resolved on the law and undisputed facts, other issues require trial.

The Potented Invention

The '324 patent, entitled "Ribbed Bottom Structure for Plastic Container", inventors Suppayan M. Krishnakumar, Siegfried S. Roy, John F. E. Pocock, Salil K. Das, and Gautam K. Mahajan, is directed to a plastic bottle whose bottom structure has sufficient flexibility to impart improved impact resistance, combined with sufficient rigidity to resist deformation under internal pressure. The patented bottle is said to provide a superior combination of these properties. The bottom structure is illustrated as follows:

[SEE FIG 2 IN ORIGINAL]

Claim 1 is the broadest claim of the '324 patent:

1. A container having a sidewall and a bottom structure closing the container at an end portion of the sidewall,

the outer surface of the bottom structure comprising a central concavity,

a convex heel surrounding the concavity and merging therewith and with

the sidewall end portion, the lowermost points of the heel lying in a common plane,

and a plurality of ribs interrupting the outer surface of the concavity and distributed in a symmetrical [**5] array,

each rib extending longitudinally in the direction of the heel and downwardly from an inner portion of the concavity, whereby the outer end portion of each rib is lower than the inner end portion thereof,

characterized by the feature that the ribs are hollow.

Claims 2 through 5 include additional limitations, described as contributing to the structure's rigidity, flexibility, or both. Claim 2 specifies the ratios of thickness of the walls of the bottom structure to the thickness of the sidewall end portions. Claim 3 specifies that the margins of each rib merge smoothly with adjacent portions of the bottom structure. Claim 4 specifies that each rib is convex relative to the bottom structure. Claim 5 specifies that each rib is of fusiform (a gently tapered shape at the ends) configuration. Each claim carries an independent presumption of validity. [*1267] 35 U.S.C. § 282, and stands or falls independent of the other claims. *Altoona Public Theatres, Inc. v. American Tri-Ergon Corp.*, 294 U.S. 477, 487, 79 L. Ed. 1005, 55 S. Ct. 455 (1935).

Continental brought suit for patent infringement against Monsanto Company and Monsanto's successor in this business. Hoover Universal, Inc. and Hoover's parent [**6] company, Johnson Controls (collectively "Monsanto"). Monsanto moved for partial summary judgment based on issues of validity under 35 U.S.C. §§ 102 and 103.

I

35 U.S.C. § 102(a)

The statutory requirement that a patented invention be "new" is tested in accordance with 35 U.S.C. § 102(a), which provides that:

§ 102. A person shall be entitled to a patent unless--

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for patent. . . .

The district court found that all the claims of the '324 patent were anticipated by *U.S. Patent No. 3,468,443* (the Marcus patent). We conclude that the district court erred in claim interpretation, and also found disputed facts adversely to the nonmovant, thus inappropriately deciding the issue summarily.

Anticipation under § 102(a) requires that the identical invention that is claimed was previously known to others and thus is not new. *Scrapps Clinic*, 927 F.2d at 1576, 18 U.S.P.Q.2d at 1010; *Titanium Metals Corp. of Am. v. Banner*, 778 F.2d 775, 780, 227 U.S.P.Q. (BNA) 773, 777-78 (Fed. Cir. 1985); [**7] *Lindemann Maschinenfabrik GmbH v. American Hoist and Derrick Co.*, 730 F.2d 1452, 1458, 221 U.S.P.Q. (BNA) 481, 485 (Fed. Cir. 1984). When more than one reference is required to establish unpatentability of the claimed invention anticipation under § 102 can not be found, and validity is determined in terms of § 103.

It was Monsanto's burden to show that every element of the several claims of the '324 patent was identically described in the asserted anticipating reference, the Marcus patent. The district court focused on the term "characterized by the feature that the ribs are hollow", which limits all of the '324 patent claims. Continental argues that the district court incorrectly construed this term, as a matter of law, and that the Marcus patent shows ribs that are not hollow, as that term is used in the '324 patent. Continental also points to other differences between the '324 claims and the description in the Marcus patent.

The Marcus patent rib structure is illustrated in Figure 5 and in cross-section in Figure 6:

[SEE FIG.5 IN ORIGINAL]

[SEE FIG.6 IN ORIGINAL]

[*1268] The Marcus patent does not state that its ribs are "hollow", or use a similar term. Continental's witnesses [**8] testified by deposition that the Marcus

patent shows solid, not hollow, ribs. A witness (Adomaitis) had stated in an internal memorandum written at Continental in 1969, well before this litigation arose, that "the ribs of their [Marcus'] web can be made of solid beams only." Another witness, '324 co-inventor Pocock, testified that:

It seems evident to me that he [Marcus] was trying to produce some kind of container integrity by the production of essentially solid ribs on the bottom of the bottle. It seems to go to great length here to illustrate them as such.

Krishnakumar, another co-inventor, testified that it "is very obvious the ribs are shown solid", and that Figures 5 and 6 as well as Figures 7 through 12 of the Marcus patent all show solid ribs. However, Marcus, testifying for Monsanto, testified that his ribs were hollow, and that conventional blow molding would inherently produce hollow ribs.

The district court defined "hollow" as meaning that "the inside contour of the ribs generally follows the outside contour thereof", a definition on which the parties agreed. *Continental*, 11 U.S.P.Q.2d at 1764. See the court's opinion, 11 U.S.P.Q.2d at 1764-68, [**9] for various sketches made by the witnesses. Continental states that the district court erred in construing "hollow", and that the phrase "characterized by the feature that the ribs are hollow" must be construed in terms of the patent in which it appears. See, e.g., *Tandon Corp. v. United States Int'l Trade Comm'n*, 831 F.2d 1017, 1021, 4 U.S.P.Q.2d (BNA) 1283, 1286 (Fed. Cir. 1987). The '324 patent explicitly distinguished the Marcus patent teachings, stating that the '324 ribs are, unlike Marcus, not filled with plastic. The '324 specification uses the term "hollow", as do the prosecution history and the claims, for this purpose. The '324 patent's usage of "hollow" is illustrated in the rib cross-section in Figure 5A:

[SEE FIG 5A IN ORIGINAL]

The Marcus patent's rib structure thus was explicitly differentiated by the term "hollow" as used in the '324 specification, drawings, and prosecution history. Since the claim term must be construed as used by the patentee, the district court erred in its construction of the '324

claim term "hollow". On correct claim construction, the factual question of anticipation must be decided.

Monsanto's argument is that hollow [*10] ribs were inherently produced by Marcus. Monsanto thus argues that anticipation lies because the Marcus patent's ribs are "inherently" hollow, regardless of how they are shown in the Marcus patent. Monsanto argues that because the Marcus ribs are formed by injection blow molding, which is the same process described for the Conobase '324 ribs, hollow ribs are inherently disclosed in the Marcus patent.

To serve as an anticipation when the reference is silent about the asserted inherent characteristic, such gap in the reference may be filled with recourse to extrinsic evidence. Such evidence must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. *In re Oelrich*, 666 F.2d 578, 581, 212 U.S.P.Q. (BNA) 323, 326 (CCPA 1981) (quoting *Hansgig v. Kemmer*, 26 C.C.P.A. 937, 102 F.2d 212, 214, 40 U.S.P.Q. (BNA) 665, 667 (CCPA 1939)) provides:

[*1269] Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing *may* result from a given set of circumstances is not sufficient. [Citations omitted.] If, [*11] however, the disclosure is sufficient to show that the natural result flowing from the operation as taught would result in the performance of the questioned function, it seems to be well settled that the disclosure should be regarded as sufficient.

This modest flexibility in the rule that "anticipation" requires that every element of the claims appear in a single reference accommodates situations where the common knowledge of technologists is not recorded in the reference; that is, where technological facts are known to those in the field of the invention, albeit not known to judges. It is not, however, a substitute for determination of patentability in terms of § 103.

Continental does not dispute the applicability of the injection blow molding process. However, Continental disputes the material fact of whether this process necessarily produced "hollow" ribs in the Marcus base

structure, as the term "hollow" is used in the '324 patent. Resolution of this disputed fact adversely to Continental was improper on summary judgment. The grant of summary judgment of anticipation under § 102(a) is vacated. The issue requires trial.

II

35 U.S.C. § 102(b)

The district court also held that [*12] the Marcus bottle was on sale, 35 U.S.C. § 102(b). Section 102(b) bars entitlement to a patent when:

(b) the invention was . . . in public use or on sale in this country, more than one year prior to the date of the application for patent in the United States. . . .

The Marcus bottle was developed some ten years before the filing date of the '324 patent, during a project wherein Marcus' employer, Admiral Plastics or APL Corporation, entered into agreements with the Coca-Cola Company for the development of a suitable plastic bottle. The agreements provided that Admiral Plastics would make and Coca-Cola would test the bottles, and that if a satisfactory bottle was developed it would be manufactured by Admiral and purchased by Coca-Cola. Minimum commercial quantities and maximum commercial prices were stated in an agreement, and costs were a matter of discussion. Admiral produced a variety of bottle shapes, including the Marcus bottle. The project was terminated after about two years, because the "mechanical performance" requirements were not met, as Coca-Cola wrote at the time.

The district court reasoned that this project "called for the eventual marketing of the Marcus bottles once [*13] all technical difficulties were resolved". *Continental*, 11 U.S.P.Q.2d at 1766, and on this basis held that the Marcus bottles were on sale. This holding was in error, for the "on sale" bar of § 102(b) does not arise simply because the intended customer was participating in development and testing. See *Great Northern Corp. v. Davis Core & Pad Co.*, 782 F.2d 159, 164-65, 228 U.S.P.Q. (BNA) 356, 358 (Fed. Cir. 1986). In *Baker Oil Tools, Inc. v. Geo Yam, Inc.*, 828 F.2d 1558, 1563-65, 4 U.S.P.Q.2d (BNA) 1210, 1213-15 (Fed. Cir. 1987), this court summarized various factors

pertinent to the "on sale" bar when there is an issue concerning the relationship between the patentee and the customer; for example, whether there was a need for testing by other than the patentee; the amount of control exercised; the stage of development of the invention; whether payments were made and the basis thereof; whether confidentiality was required; and whether technological changes were made. All of the circumstances attending the relationship must be considered in light of the public policy underlying § 102(b). *UMC Electronics Co. v. United States*, 816 F.2d 647, 656, 2 U.S.P.Q.2d (BNA) 1465, 1471-72 (Fed. Cir. 1987), [*14] cert. denied, 484 U.S. 1025, 98 L. Ed. 2d 761, 108 S. Ct. 748 (1988).

The district court acknowledged that all technical difficulties were not resolved and that no sales were ever made. [*1270] Although Admiral Plastics' hope was surely commercial sales, and the record shows that prices and quantities were discussed, this does not of itself place the subject matter "on sale" in the sense of § 102(b). The Marcus bottle was part of a terminated development project that never bore commercial fruit and was cloaked in confidentiality. While the line is not always bright between development and being on sale, see generally *UMC Electronics*, *supra*, in this case the line was not crossed. The "on sale" bar is measured by "the time the public came into possession of the invention", *id.* at 655, 2 U.S.P.Q. 2d at 1471 (quoting *In re Foster*, 52 C.C.P.A. 1808, 343 F.2d 980, 987-88, 145 U.S.P.Q. (BNA) 166, 173 (CCPA 1965), cert. denied, 383 U.S. 966, 16 L. Ed. 2d 307, 86 S. Ct. 1270, 149 U.S.P.Q. (BNA) 906 (1966) ("What starts the period running is clearly the availability of the invention to the public through the categories of disclosure enumerated in 102(b). . . ." (emphasis in original))). [*15] We conclude that the district court erred in holding that the circumstances that here existed placed the Marcus bottles "on sale" in terms of § 102(b). We therefore reverse and direct that on remand judgment on this issue shall be entered in favor of Continental, as a matter of law.

III

35 U.S.C. § 103

Obviousness, 35 U.S.C. § 103, is reviewed as a legal conclusion based upon underlying facts of four general categories, *viz.* the scope and content of the prior art, the differences between the prior art and the claimed invention, the level of ordinary skill at the time the

invention was made, and any objective considerations that may be present. *Graham v. John Deere Co.*, 383 U.S. 1, 17, 15 L. Ed. 2d 545, 86 S. Ct. 684, 148 U.S.P.Q. (BNA) 459 (1966); *Interconnect Planning Corp. v. Feil*, 774 F.2d 1132, 1137-38, 227 U.S.P.Q. (BNA) 543, 547 (F.C. Cir. 1985).

The parties agreed that the scope and content of the prior art was adequately represented by four references: the Marcus patent discussed in Part I *ante*, a patent to Colombo (*U.S. Patent No. 3,403,804*), and two patents owned by Continental, *U.S. Patent No. 3,598,270* (the Petaloid patent), and No. 3,935,955 (the Decaloid patent). They agreed [*16] on little else. In granting summary judgment of invalidity for obviousness, the district court found certain disputed material facts and misapplied certain precepts of law. We conclude that the issue was not amenable to summary resolution. Although it is not entirely clear how the references were combined by the court, we shall review the references briefly, in order to explain our conclusion.

The Petaloid Patent

The district court referred to the deposition testimony of Siegfried Roy, one of the co-inventors of the '324 patent, that the Petaloid base, invented, was similar to the Conobase. Continental points out that neither Roy nor any other deponent suggested that the Petaloid base could be or should be inverted, or that inversion would provide an improved base structure. In *In re Gordon*, 733 F.2d 900, 902, 221 U.S.P.Q. (BNA) 1125, 1127 (Fed. Cir. 1984) this court held that although a prior art device could have been turned upside down, that did not make the modification obvious unless the prior art fairly suggested the desirability of turning the device upside down.

Continental points out that the Petaloid description differs in several other ways from [*17] the '324 invention. In the '324 structure the outer end of each rib is lower than the inner end, whereas in the Petaloid structure the outer ends of the ribs are higher than the inner ends; that is, the ribs in the Petaloid base extend upward from the center to the sidewall. The Petaloid bottle is supported on feet extending between the ribs, such feet being the locations for stress concentrations. The following drawing is from the Petaloid patent:

[*1271] [SEE FIG 3 IN ORIGINAL]

Continental states that the '324 Conobase is not only different, but avoids the stress concentrations of the Petaloid device, thus enhancing impact resistance. Monsanto argues that Continental simply used the Petaloid hollow ribs in combination with the Marcus patent. This requires determination of whether there was something in the prior art as a whole to suggest the desirability, and thus the obviousness, of making the combination, in a way that would produce the '324 structure. See, e.g., *Uniroval, Inc. v. Rudkin-Wiley Corp.*, 837 F.2d 1044, 1051, 5 U.S.P.Q.2d (BNA) 1434, 1438 (Fed. Cir.), cert. denied, 488 U.S. 825, 102 L. Ed. 2d 51, 109 S. Ct. 75 (1988). Continental argues that it is not apparent. [*18] even with hindsight, how any combination of the Petaloid and Marcus patents or other references lead to the '324 base. The Petaloid patent shows concave ribs that extend all the way to the sidewall, while the Marcus ribs extend "from the heel" toward an annular central ring. The Petaloid base has wide, petal-like, open ribs, while Marcus shows narrow, beam-like ribs. The deposition testimony was in conflict as to the inferences drawn from the references.

On this disputed issue, drawing reasonable inferences in favor of the non-movant, it has not been established that one skilled in the art would be motivated to select and combine features from each source in order to make the '324 base. *Interconnect Planning*, 774 F.2d at 1143, 227 U.S.P.Q. at 551 ("When prior art references require selective combination by the court to render obvious a subsequent invention, there must be some reason for the combination other than the hindsight gleaned from the invention itself").

The Decaloid Patent

The district court also referred to combination of the Decaloid base with the Marcus base. The Decaloid base has ten hollow ribs that extend to the sidewall, and ten feet [*19] between the ribs:

[*1272] [SEE FIG 2 IN ORIGINAL]

Monsanto does not explain, and we can not discern, how the combination with Marcus would have led a person of ordinary skill to the '324 base. The court's summary holding of obviousness based on these references, separately or in combination, can not be sustained.

The Colombo Patent

The Colombo base, like the Petaloid and Decaloid bases, has hollow ribs that extend to the sidewall, in a still different structure from that of Marcus and also from that of the '324 patent. Colombo describes his ribs as inverted U-shapes, concave, located on the outer surface of the central concavity:

[SEE FIG. 4 IN ORIGINAL]

Again, drawing reasonable factual inferences in favor of Continental, and in the absence of any suggestion or motivation in the prior art as a whole to make a selective combination of the Colombo and Marcus [*1273] structures along with other changes needed to obtain the '324 structure, summary judgment of obviousness was inappropriate.

The district court found that there was no substantial difference between the '324 invention and the combined teachings of the prior art:

As obviousness can be established on the basis of the combined [*20] teachings of references, we think it is clear that simple enhancements of existing prior art, i.e. inverting the '270 petaloid base, do not constitute a substantial difference between the subject matter claimed in the '324 patent and that of the prior art. Thus, the facts of this case reveal no substantial difference between '324 and the prior art.

Continental, 11 U.S.P.Q.2d at 1769 (citation omitted). However, as we have discussed, the criterion of § 103 is not whether the differences from the prior art are "simple enhancements", but whether it would have been obvious to make the claimed structure.

Objective Indicia

The district court concluded that the structure in suit is simply a variation on known themes. It is in such circumstance that the objective indicia — the so-called secondary considerations — are most useful to the decision-maker. The significance of a new structure is often better measured in the marketplace than in the courtroom.

Thus when differences that may appear

technologically minor nonetheless have a practical impact, particularly in a crowded field, the decision-maker must consider the obviousness of the new structure in this light. Such [*21] objective indicia as commercial success, or filling an existing need, illuminate the technological and commercial environment of the inventor, and aid in understanding the state of the art at the time the invention was made. See *In re Piasecki*, 745 F.2d 1468, 1475, 223 U.S.P.Q. (BNA) 785, 790 (Fed. Cir. 1984) (secondary considerations "often establish that an invention appearing to have been obvious in light of the prior art was not" (quoting *Siratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 1538-39, 218 U.S.P.Q. (BNA) 871, 879 (Fed. Cir. 1983))).

Continental licensed the '324 counterpart Japanese patent to a Japanese company, Yoshino, that we are told had been unable to develop a plastic bottle for hot-fill applications. A witness for Toyo Seikan, another Japanese licensee, testified that the Conobase "sustains itself in higher temperatures, and it does not cause buckling after you fill [the bottle]", as compared with previously available plastic bottles. Continental asserts that Monsanto had been unable to develop a satisfactory bottle for hot-fill applications, and had therefore obtained this technology from Yoshino.

The district court [*22] acknowledged the commercial success of the Conobase, but stated that "we are not convinced that the Conobase *alone* accounts for any of the success." 11 U.S.P.Q.2d at 1770 (emphasis in original). The court suggested that the commercial

success in Japan was due to the market strength of the Japanese licensees, and held that there is no nexus between the merits of the product and its commercial success. It is not necessary, however, that the patented invention be solely responsible for the commercial success, in order for this factor to be given weight appropriate to the evidence, along with other pertinent factors. See generally *Demaco Corp. v. F. Von Langsdorff Licensing Ltd.*, 851 F.2d 1387, 1392-94, 7 U.S.P.Q.2d (BNA) 1222, 1226-28 (Fed. Cir.), cert. denied, 488 U.S. 956, 102 L. Ed. 2d 383, 109 S. Ct. 395 (1988); *Rosemount, Inc. v. Beckman Instruments, Inc.*, 727 F.2d 1540, 1546, 221 U.S.P.Q. (BNA) 1, 7 (Fed. Cir. 1984). Monsanto also states that the Conobase is different from the '324 invention, so that even were the Conobase successful, this does not inure to the benefit of the '324 patent. It is apparent that the factual issues surrounding [*23] the objective indicia were disputed, and material.

In view of the material facts requiring resolution, the issue of obviousness was not properly decided on motion for summary [*1274] judgment. We vacate the grant based on 35 U.S.C. § 103, and remand for trial of this issue and the other issues remaining in the case.

Costs

Costs in favor of Continental.

REVERSED IN PART, VACATED IN PART, and REMANDED.

LEXSEE 329 F.3D 1358

DAYCO PRODUCTS, INC., Plaintiff-Appellant, v. TOTAL CONTAINMENT, INC., Defendant-Appellee.

02-1497

UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT*329 F.3d 1358; 2003 U.S. App. LEXIS 10374; 66 U.S.P.Q.2D (BNA) 1801***May 23, 2003, Decided**

PRIOR HISTORY: [*1] Appealed from: United States District Court for the Western District of Missouri. Senior Judge Scott O. Wright.

Dayco Prods. v. Total Containment, Inc., 218 F. Supp. 2d 1129, 2002 U.S. Dist. LEXIS 16769 (W.D. Mo., 2002)

DISPOSITION: Vacated and remanded.

COUNSEL: Constance S. Huttner, Skadden, Arps, Slate, Meagher & Flom, LLP, of New York, New York, argued for plaintiff-appellant. With her on the brief were Edward V. Filardi and Douglas R. Nemec.

Randolph J. Huis, Volpe and Koenig, P.C., of Philadelphia, Pennsylvania, argued for defendant-appellee. With him on the brief was John J. O'Malley.

JUDGES: Before MAYER, Chief Judge, MICHEL, and DYK, Circuit Judges.

OPINION BY: DYK

OPINION

[*1360] DYK, Circuit Judge.

Dayco Products Inc. ("Dayco") appeals from the decision of the United States District Court for the Western District of Missouri granting summary judgment of unenforceability of *U.S. Patent Nos. 5,199,753* ("the '752 patent"), 5,297,822 ("the '822 patent"), 5,380,050 ("the '050 patent"), and 5,486,023 ("the '023 patent") (collectively "the patents-in-suit") and granting summary judgment of invalidity as to certain claims of those

patents, *Dayco Prods., Inc. v. Total Containment, Inc.*, 218 F. Supp. 2d 1129 (W.D. Mo. 2002). Having granted summary judgment of unenforceability and invalidity, the district court concluded [*2] that there was no liability for infringement. Because we conclude that summary judgment for the defendant was improper and genuine issues of material fact remain to be determined, we vacate the decision of the district court and remand for trial.

BACKGROUND

This case returns to us after a remand by this court. *Dayco Prods., Inc. v. Total Containment, Inc.*, 258 F.3d 1317, 59 USPQ2d 1489 (Fed. Cir. 2001) ("*Dayco I*"). Dayco is the owner of the '752, '822, '050, and '023 patents. Total Containment, Inc. ("TCI") is accused of infringing certain claims of those patents. In the earlier appeal, we reversed the district court's grant of summary judgment of noninfringement in favor of defendant TCI with respect to the '752, '822, '050, and '023 patents because the district court had adopted an incorrect claim construction. *Id.* at 1324, 59 USPQ2d at 1495. We affirmed the district court's grant of summary judgment of non-infringement with respect to *U.S. Patent No. 5,129,686* ("the '686 patent"). *Id.* at 1328, 59 USPQ2d at 1498. On remand, the remaining asserted claims were: claims 1, 2, 8-12, and 18-20 of the '752 patent; claims 1, 2, and [*3] 8-10 of the '822 patent; claims 1, 2, 8-12, and 18-20 of the '050 patent; and claims 1-8 of the '023 patent (collectively "the asserted claims"). The district court again granted summary judgment for the accused infringer (TCI) with respect to the '752, '822, '050, and '023 patents, this time on the ground that the patents were unenforceable due to iniquitable conduct during prosecution, and that the asserted claims were invalid as anticipated.

I

The patents-in-suit all claim priority through a string of continuation applications to U.S. Application No. 408,161 ("the '161 application") filed September 15, 1989, and include identical figures and substantially identical written descriptions. The '161 application issued as *U.S. Patent No. 5,037,143* ("the '143 patent"). The technology disclosed in the patents-in-suit was described in detail in *Dayco I*.

Briefly, the patents-in-suit are directed to flexible hoses and coupling assemblies that connect to each other for use in underground gas containment systems. When assembled for use (as shown below), a hose (31) is inserted into the coupling assembly (32), which forms a seal between the hose and the assembly.

[SEE DIAGRAM IN ORIGINAL]

[**4] [*1361] Ridges and recesses circumscribe the interior corrugated surface of the hose. The coupling includes an outer sleeve (50) having a flat inner surface and an inner sleeve (51) having a contoured outer surface. The sleeves respectively contact the exterior and interior surfaces of the hose (31). The inner sleeve, the contours on the outer surface of which complement the ridges and recesses of the hose, is expanded outwards to seal the hose between the outer sleeve and the inner sleeve.

Dayco is also the assignee of a separate family of applications that claim original priority to U.S. Application No. 993,196 ("the '196 application") filed December 18, 1992 (collectively "the '196 family"). The technology disclosed in the '196 family is substantially similar to that disclosed in the patents-in-suit, also being directed to flexible hoses and coupling assemblies. The '196 application itself was abandoned during prosecution, and two continuation applications, U.S. Application Nos. 197,891 ("the '891 application") and 263,275 ("the '275 application"), were filed claiming priority therefrom. The '891 and '275 applications respectively issued as *U.S. Patent Nos. 5,356,182* ("the '182 patent") [**5] and 5,430,929 ("the '929 patent"). The '182 and '929 patents are not asserted in the present appeal.

The '196 family of applications and the applications for the patents-in-suit were assigned to two different examiners by the Patent and Trademark Office ("PTO") and were pending at the same time. The applications that issued as patents-in-suit were assigned to examiner David

Arola and the '196 family of applications was assigned to examiner Eric Nicholson. The applications in the '196 family included specific references to members of the family of applications that issued as the patents-in-suit. *See, e.g.*, '929 patent, col. 1, ll. 51-65. Thus, examiner Nicholson was made aware of the applications for the patents-in-suit. However, there is no evidence that examiner Arola was ever notified of the existence of the applications in the '196 family. The claims submitted in the '196 family of applications were in some respects substantially identical to the claims of the patents-in-suit and were rejected by examiner Nicholson on three separate occasions under 35 U.S.C. § 103 as being unpatentable over *U.S. Patent No. 3,331,981* to Wilson ("Wilson") in view of [**6] *U.S. Patent No. 5,096,234* to Octiker ("Octiker"). Examiner Nicholson found that Wilson taught all of the elements of the claims except the recited outwardly expanding sleeve, which he concluded was obvious in view of Octiker. Examiner Arola was not advised of this rejection. [**1362] Nor was the Wilson patent, a reference cited by examiner Nicholson as the ground for rejection, even called to examiner Arola's attention.

II

Upon remand of this matter after *Dayco I*, the defendant renewed its motions for summary judgment on the basis of unenforceability and invalidity. On June 21, 2002, the district court granted the defendant's motions. *Dayco*, 218 F. Supp. 2d at 1130.

The first motion for summary judgment granted by the district court was directed to unenforceability. The district court agreed with TCI's argument that Dayco committed inequitable conduct when it "intentionally withheld material prior art and information concerning [the] co-pending ['196] application from the patent examiner [assigned to the patents-in-suit]." *Id.* at 1131. The court also held that Dayco committed inequitable conduct by failing to disclose *U.S. Patent No. 3,331,981* [**7] issued to Wilson ("Wilson"). Finally, the inequitable conduct determination was also based on the failure to disclose the rejection of substantially similar claims in the '196 patent based on Wilson.

The second summary judgment motion granted by the district court was directed to invalidity under 35 U.S.C. §§ 102 and 103. This motion was granted as to anticipation under § 102. While the district court referred to other prior art materials, the grant of summary

judgment was based solely on three pieces of prior art. The court concluded that every element of all of the asserted claims of the patents-in-suit was disclosed in *U.S. Patent No. 2,268,142* issued to Lusher et al. ("*Lusher*") and also in a publication describing the Titeflex Chemical Transfer Hose No. R292 ("*the Titeflex Publication*"). *Id.* at 1136-38. The court also concluded that the claims of the '822 patent were anticipated by a prior art coupling sold by Scovill. *Id.*

The court dismissed an expert declaration submitted by Dayco concluding that the cited prior art failed to expressly or inherently teach each and every limitation of the asserted claims. The court concluded [**8] that "the reference and the claimed invention are easily understandable without the need for expert testimony." *Id.* at 1137. The court also concluded that, "having found that Dayco's patents are invalid under 35 U.S.C. § 102, the court need not address the issue of obviousness [under § 103]." *Id.* at 1138.

Dayco timely filed this appeal. We have jurisdiction under 28 U.S.C. § 1295(a)(1).

DISCUSSION

We review a district court's grant of a motion for summary judgment without deference. *Fihicon Endo-Surgery, Inc. v. United States Surgical Corp.*, 149 F.3d 1309, 1315, 47 USPQ2d 1272, 1275 (Fed. Cir. 1998).

I Inequitable Conduct

We first address the district court's grant of summary judgment of inequitable conduct and conclude that that decision must be set aside. In order "to prove inequitable conduct in the prosecution of a patent, [the defendant] must have provided evidence of affirmative misrepresentations of a material fact. Failure to disclose material information, or submission of false material information, coupled with an intent to deceive." *Purdue Pharma L.P. v. Boehringer Ingelheim GmbH*, 237 F.3d 1359, 1366, 57 USPQ2d 1647, 1652 (Fed. Cir. 2001) [**9] (citations omitted). Both intent and materiality are questions of fact that must be proven by clear and convincing evidence. *Id.* The inequitable conduct analysis is performed in two steps comprising "first, a determination of [*1363] whether the withheld reference meets a threshold level of materiality and intent to mislead, and second, a weighing of the materiality and

intent in light of all the circumstances to determine whether the applicant's conduct is *so culpable* that the patent should be held unenforceable." *Id.* (emphasis added) (citations omitted).

A question exists as to the proper standard of materiality. See, e.g., 6 *Chisum on Patents* § 19.03[3] (2000). For many years this court held that materiality for purposes of an inequitable conduct determination required a showing that "a reasonable examiner would have considered such prior art important in deciding whether to allow the patent application." *Driscoll v. Cebalo*, 731 F.2d 878, 884, 221 USPQ 745, 750 (Fed. Cir. 1982); see also *Fox Indus., Inc. v. Structural Pres. Sys., Inc.*, 922 F.2d 801, 803, 17 USPQ2d 1579, 1580 (Fed. Cir. 1990); *Gardeo Mfg., Inc. v. Herst Lighting Co.*, 820 F.2d 1209, 1214, 2 USPQ2d 2015, 2019 (Fed. Cir. 1987). [**10] Information did not need to be prior art in order to be material, but "instead embraced any information that a reasonable examiner would substantially likely consider important in deciding whether to allow an application to issue as a patent." *Akron Polymer Container Corp. v. Exxel Container, Inc.*, 148 F.3d 1380, 1382, 47 USPQ2d 1533, 1534 (Fed. Cir. 1998) (citations omitted). This interpretation of materiality was based, in part, on 37 C.F.R. § 1.56(a) (1991),¹ which defined materiality using a "reasonable examiner" standard. See *Driscoll*, 731 F.2d at 884, 221 USPQ at 750; *Gardeo*, 820 F.2d at 1214, 2 USPQ2d at 2019 (stating that § 1.56 is "the appropriate starting point for determining materiality").

1 That regulation provided:

A duty of candor and good faith
toward the Patent and Trademark Office rests on the inventor, on each attorney or agent who prepares or prosecutes the application and on every other individual who is substantively involved in the preparation or prosecution of the application and who is associated with the inventor, with the assignee or with anyone to whom there is an obligation to assign the application. All such individuals have a duty to disclose to the Office information they are aware

of which is material to the examination of the application. Such information is material where there is a substantial likelihood that a reasonable examiner would consider it important in deciding whether to allow the application to issue as a patent.

37 C.F.R. § 1.56(a) (1991) (emphases added).

[**11] In 1992, however, the Patent Office amended its rules to provide a different standard for materiality.² The new rule "was not intended to constitute a significant substantive break in the previous standard." *Hoffmann-La Roche, Inc. v. Promega Corp.*, 323 F.3d 1354, 1366 n.2, 66 USPQ2d 1385, 1395 n.2 (Fed. Cir. 2003). The new rule reiterated the preexisting "duty of candor and good faith," but more [**1364] narrowly defined materiality, providing for disclosure where the information establishes either "a prima facie case of unpatentability" or "refutes, or is inconsistent with a position the applicant takes." 37 C.F.R. § 1.56 (1992) ("Rule 56"). In promulgating the new regulation, the Patent Office noted that: "Section 1.56 has been amended to present a clearer and more objective definition of what information the Office considers material to patentability. The rules do not define fraud or inequitable conduct which have elements both of materiality and of intent." *Duty of Disclosure*, 57 Fed. Reg. 2021, 2024 (Jan. 17, 1992). In response to a comment suggesting that courts might interpret the duty of "candor and good faith" to require more [**12] than Patent Office rules require, the Patent Office stated that the rule was "modified to emphasize that there is a duty of candor and good faith which is broader than the duty to disclose material information." *Id.* at 2025. Thus, the extent, if any, to which the Patent Office rulemaking was intended to provide guidance to the courts concerning the duty of disclosure in the context of inequitable conduct determinations is not clear.

2 The new rule provides:

information is material to patentability when it is not cumulative to information already of record or being made of record in the application, and

(1) It establishes, by itself or in combination with other information, a prima facie case of unpatentability of a claim; or

(2) It refutes, or is inconsistent with, a position the applicant takes in:

(i) Opposing an argument of unpatentability relied on by the Office, or

(ii) Asserting an argument of patentability.

A prima facie case of unpatentability is established when the information compels a conclusion that a claim is unpatentable under the preponderance of evidence, burden-of-proof standard, giving each term in the claim its broadest reasonable construction consistent with the specification, and before any consideration is given to evidence which may be submitted in an attempt to establish a contrary conclusion of patentability.

37 C.F.R. § 1.56(b) (2003).

[**13] Since the time of the 1992 amendment we have continued to apply the reasonable examiner standard, but only as to cases that were prosecuted under the earlier version of Rule 56. *Brasseler, U.S.A. I., L.P. v. Stryker Sales Corp.*, 267 F.3d 1370, 1380, 60 USPQ2d 1482, 1488 (Fed. Cir. 2001); *GFI, Inc. v. Franklin Corp.*, 265 F.3d 1268, 1274, 60 USPQ2d 1141, 1143-44 (Fed. Cir. 2001); *Li Second Family Ltd. v. Toshiba Corp.*, 231 F.3d 1373, 1379, 56 USPQ2d 1681, 1686 (Fed. Cir. 2000). The court has not decided whether it should adhere to the preexisting standard for inequitable conduct in prosecutions occurring after the effective date of the new rule. See *Molins PLC v. Textron*, 48 F.3d 1172, 1179 n.8, 33 USPQ2d 1823, 1827 n.8 (Fed. Cir. 1995); see also *Duro-Last, Inc. v. Custom Seal, Inc.*, 321 F.3d 1098, 1109-10, 66 USPQ2d 1025, 1030 (Fed. Cir. 2003); *PerSeptive Biosystems, Inc. v. Pharmacia Biotech, Inc.*,

225 F.3d 1315, 1322 n.2, 56 USPQ2d 1001, 1005 n.2 (Fed. Cir. 2000); *Upjohn Co. v. Mova Pharm. Corp.*, 225 F.3d 1306, 1312, 56 USPQ2d 1286, 1291 (Fed. Cir. 2000). Thus, we [*14] have not decided whether the standard for materiality in inequitable conduct cases is governed by equitable principles or by the Patent Office's rules.³

3 The court's authority to render a patent unenforceable for inequitable conduct is founded in the equitable principle that "he who comes into equity must come with clean hands." *Precision Instrument Mfg. Co. v. Auto. Maint. Mach. Co.*, 324 U.S. 806, 814, 89 F. Ed. 1381, 65 S. Ct. 993, 1945 Dec. Comm'r Pat. 582 (1945); *United States v. Am. Bell Tel. Co.*, 128 U.S. 315, 364-65, 32 L. Ed. 450, 9 S. Ct. 90, 1888 Dec. Comm'r Pat. 558 (1888) (describing the genesis of inequitable conduct in the patent context as from the equity jurisprudence in real property law); *Winbond Elecs. Corp. v. Int'l Trade Comm'n*, 262 F.3d 1363, 1372 (Fed. Cir. 2001).

Three of the patents-in-suit were filed and prosecuted after the January 17, 1992, rule change, and the prosecution of the other application continued after the rule change. Because we conclude that the outcome of this appeal [*15] would be the same under either materiality standard, we leave for another day a final disposition of this issue. See *PerSeptive*, 225 F.3d at 1322 n.2, 56 USPQ2d at 1005 n.2.

A. The '196 Application

Three pieces of information were relied upon by the district court as the basis for its holding of unenforceability, (1) pendency of the '196 application before examiner Nicholson, (2) the Wilson patent, and (3) the rejection of claims in the '196 application under 35 U.S.C. § 103 by examiner Nicholson based on Wilson.

[*1365] We will first address the '196 application. The district court found inequitable conduct because the same attorney prosecuted both the patents-in-suit and the '196 application, but failed to disclose the existence of the '196 application to examiner Arola. The Manual of Patent Examiner Procedure ("M.P.E.P.") makes clear that "if an inventor has different applications pending in which similar subject matter but patentably indistinct claims are present that fact must be disclosed to the examiner of each of the involved applications." M.P.E.P. § 2001.06(b)

(emphasis added). This court has held that under the "reasonable examiner" [*16] standard of materiality, "[a]n application was highly material to the prosecution of [an application, where] it could have conceivably served as the basis of a double patenting rejection." *Akron Polymer*, 148 F.3d at 1382, 47 USPQ2d at 1534. The judicially created doctrine of obviousness-type double patenting "prohibits an inventor from obtaining a second patent for claims that are not patentably distinct from the claims of [a] first patent." *In re Lonardo*, 119 F.3d 960, 965, 43 USPQ2d 1262, 1266 (Fed. Cir. 1997). Dayco argues that the '196 application did not meet the threshold level of materiality because "each of the patents-in-suit was ultimately subject to a terminal disclaimer limiting its term to that of the '143 patent, the term of which is much shorter than that of any patent that conceivably could have issued from the '929 [sic '196] application." (Appellant's Br. at 55.) Thus, Dayco's position is that inequitable conduct is measured in relation to the patent rights that the applicant actually achieved. See, e.g., *Scripps Clinic & Research Found. v. Genentech, Inc.*, 927 F.2d 1565, 1583, 18 USPQ2d 1001, 1015 (Fed. Cir. 1991) [*17] ("A reference that is material only to withdrawn claims can not be the basis of a holding of inequitable conduct."). By disclaiming the portion of its patent term to which the '196 application was relevant, Dayco argues that information as to the pendency of the '196 application cannot form the basis for an inequitable conduct finding.

Even accepting, *arguendo*, Dayco's theory that information material at the outset of prosecution may become immaterial depending on the result of the prosecution, we reach a different result here because a copending application may be material even though it cannot result in a shorter patent term when it could affect the rights of the patentee to assign the issued patents.

While Dayco is correct in noting that the patent terms of the patents-in-suit would not have been further shortened by filing a terminal disclaimer in view of the applications in the '196 family (since the terms of the patents-in-suit were limited to the term of the earlier '143 patent), shortening of a patent's term is not the only result of overcoming a double patenting rejection by terminal disclaimer. In order to overcome a double patenting rejection using a terminal disclaimer, [*18] the applicant must also include in the disclaimer "a provision that any patent granted on that application . . . shall be enforceable only for and during such period that said

patent is commonly owned with the application or patent which formed the basis for the rejection." 37 C.F.R. § 1.321(c)(3) (2002) (emphasis added). Thus, the disclosure of the '196 application to examiner Arola could have led to double patenting rejections in the applications that issued as the patents-in-suit, and a disclaimer requiring that the patents-in-suit were enforceable only so long as they were "commonly owned" with the patents issued from the '196 family. Because of the non-disclosure of the '196 application to examiner Arola, the patentee received patents that were not subject to a common ownership limitation with respect to the '196 [*1366] family. The pendency of the '196 applications was, therefore, material.

Additionally, the '196 application meets the threshold level of materiality under the new Patent Office Rule 56, in that it "establishes, by itself . . . a prima facie case of unpatentability of a claim." The basis for establishing unpatentability is the potential double [*19] patenting rejection, the same basis addressed by the court in *Akron Polymer*, 148 F.3d at 1382, 47 USPQ2d at 1534.

While the '196 application meets the threshold level of materiality, however, TCI's motion for summary judgment did not establish a threshold showing of intent to deceive. In *Akron Polymer*, under facts substantially similar to the facts here, the court determined that the requisite intent could not be inferred because the patentee did "disclose the existence of the [the second] application to the [first] application's examiner, and thus put the PTO on notice of the copendency of the two applications." *Id.* at 1383-84, 47 USPQ2d at 1535. Here, members of the family of applications that issued as the patents-in-suit were disclosed to the examiner assigned to the copending application. As in *Akron Polymer*, "this fact points away from an intent to deceive." *Id.* at 1384, 47 USPQ2d at 1536. Thus, there was no basis for summary judgment that the failure to inform examiner Arola of the existence of the '196 application satisfied the requirement of a threshold showing of intent to deceive.

B. The Wilson Patent

The [*20] second piece of information cited by the district court as a basis for its holding of inequitable conduct was the Wilson patent. The district court held that Wilson was material and not cumulative to the prior art already cited to the examiner assigned to the applications that issued as the patents-in-suit. *Dayco*, 218

F. Supp. 2d at 1134. The court concluded that Dayco had the requisite threshold intent to deceive based on the fact that "[Dayco's attorney] knew of and intentionally withheld the Wilson '981 patent from [the examiner]." ⁴ *Id.* at 1135.

4 Additionally, the district court held the '752 patent to be unenforceable for failure to cite Wilson, despite the fact that the '752 patent issued on April 6, 1993, prior to earliest citation of Wilson by the Patent Office on June 11, 1993. On appeal, TCI does not assert that this holding was proper, arguing only that Wilson was material to the prosecution of the '050, '023, and '822 patents. (Appellee's Br. at 16.) For this additional reason, the holding of unenforceability as to the '752 patent was in error.

[**21] In opposition to TCI's motion for summary judgment, Dayco submitted a declaration by its expert urging that the Wilson reference did not meet the threshold level of materiality because it was from a different field of technology and was "less pertinent than, and cumulative of, prior art that was before the examiner." (J.A. at 1624-25.) Specifically, Dayco's expert described Wilson as from the "field of electrical conduits," which he urged failed to "address the point of novelty of the accused patents." (*Id.* at 1624.) He also opined that *U.S. Patent Nos. 1,915,041* to Wallace, 3,072,174 to Vanderhoof, and 4,400,022 to Wright, which were presented to the examiner, rendered Wilson cumulative to and less pertinent than the cited prior art.

TCI argued in its motion for summary judgment that "the Wilson '981 patent is not cumulative to the prior art considered by Examiner Arola during prosecution of the patents in suit, because it discloses all of the elements of the claimed combination, with the exception of outward radial expansion, in a single reference." (J.A. at 96.) Thus, through attorney argument, TCI attempted to counter the assertions of [*1367] Dayco's expert concerning the materiality [*22] of Wilson.

We conclude that applying either standard of materiality, it was improper for the district court to conclude on summary judgment that the Wilson reference met the necessary threshold level of materiality. The mere fact that examiner Nicholson found the Wilson reference to be material is informative, but not dispositive. Whether Wilson meets the threshold level of materiality would require a detailed factual analysis of

the relevance of the teachings of that reference both with respect to the claims of the patents-in-suit and with respect to the other prior art references that were before the examiner. See, e.g., *FMC Corp. v. Manitowoc Co.*, 835 F.2d 1411, 1415, 5 USPQ2d 1112, 1115 (Fed. Cir. 1987) (holding that "prior art or information was not material . . . because it is less pertinent than or merely cumulative with prior art or information cited to or by the PTO"); 37 C.F.R. § 1.56(b) (1992) ("information is material to patentability when it is not cumulative to information already of record or being made of record in the application").

On the issue of intent, the district court also erred in concluding that the mere fact [*23] that the prosecuting attorney knew of the Wilson reference and decided not to submit it to the examiner established intent. Here, the patentee submitted a declaration from the prosecuting attorney explaining that in good faith he concluded that the reference was not material because "[he] considered it to be far afield from the accused patents at the time it was cited." (J.A. at 1612.) That explanation is not on its face implausible. The district court noted that "Dayco intended to withhold the Wilson '981 patent from the PTO." *Dayco*, 218 F. Supp. 2d at 1136. However, inequitable conduct requires not intent to withhold, but rather intent to deceive. Intent to deceive cannot be inferred simply from the decision to withhold the reference where the reasons given for the withholding are plausible. The grant of summary judgment of unenforceability based on Wilson must, therefore, be set aside. Based on the present record, there is no basis for a claim of inequitable conduct concerning the withholding of the Wilson reference.

C. The Rejection of Substantially Similar Claims

The final piece of information relied upon by the district court when granting summary judgment [*24] of unenforceability was the existence of an outstanding rejection of claims in the '196 application that were substantially similar in content and scope to claims pending in the applications that issued as the patents-in-suit. The district court relied upon the "multiple rejections of claims with identical subject matter in the '196 application and its progeny in view of the Wilson '981 patent." *Id.* at 1135.

This court has never addressed whether the prior rejection of a substantially similar claim in a copending United States application is material under the reasonable

examiner standard. The District Court for the Northern District of Indiana addressed this issue. "finding that it was important for [an examiner] to know that another knowledgeable Patent Examiner had carefully examined and rejected all claims of [another] application, including claims that were directly related to claims in the [present] application, on the grounds that the claims were obvious in light of prior art patents." *Golden Valley Microwave Foods, Inc. v. Weaver Popcorn Co.*, 837 F. Supp. 1444, 1474 (N.D. Ind. 1992). Without such a disclosure requirement "applicants [*25] [may] surreptitiously file repeated or multiple applications in an attempt to find a 'friendly' Examiner." ABA Section of Intellectual Property Law, *Annual Report 1993-1994* (1994).

[*1368] We hold that a contrary decision of another examiner reviewing a substantially similar claim meets the *Akron Polymer* "reasonable examiner" threshold materiality test of "any information that a reasonable examiner would substantially likely consider important in deciding whether to allow an application to issue as a patent." 148 F.3d at 1382, 47 USPQ2d at 1534 (emphasis in original). Patent disclosures are often very complicated, and different examiners with different technical backgrounds and levels of understanding may often differ when interpreting such documents. Although examiners are not bound to follow other examiners' interpretations, knowledge of a potentially different interpretation is clearly information that an examiner could consider important when examining an application.

We also hold that the information meets the threshold level of materiality under new *Rule 56*, in that "it refutes, or is inconsistent with, a position the applicant takes in . . . asserting an [*26] argument of patentability." 37 C.F.R. § 1.56(b)(2) (2002). When prosecuting claims before the Patent Office, a patent applicant is, at least implicitly, asserting that those claims are patentable. A prior rejection of a substantially similar claim refutes, or is inconsistent with the position that those claims are patentable. An adverse decision by another examiner, therefore, meets the materiality standard under the amended *Rule 56*. However, the district court did not address intent to deceive related to the failure to disclose the examiner's adverse decision. A trial on this issue is, therefore, necessary.

II Invalidity

We next address the district court's holding of invalidity. On appeal, TCI seeks to support the holding of

invalidity of all of the claims over the Lusher and Titeflex prior art primarily with reference to claim 1 of the '050 patent. (Appellee's Br. at 39.) Additionally, TCI supports the holding of invalidity of the claims of the '822 patent over the Scovill prior art, which we will address separately. We conclude that the district court's grant of summary judgment of invalidity must also be set aside.

A. Lusher

The first prior art reference [**27] addressed by the district court was the Lusher patent. The district court concluded that "there are no genuine factual disputes" and described its interpretation of the teachings of Lusher. *Dayco*, 218 F. Supp. 2d at 1137-38. In particular, the district court described Figure 2 of Lusher (reproduced below) as anticipating the asserted claims of the patents-in-suit.

[SEE FIGURE 2 IN ORIGINAL]

As this court has stated, "the dispositive question regarding anticipation is whether one skilled in the art would reasonably understand or infer from the [prior art reference's] teaching" that every claim element was disclosed in that single reference. *In re Baxter Travenol Labs.*, 952 F.2d 388, 390, 21 USPQ2d 1281, 1284 (Fed. [**1369] Cir. 1991) (emphasis added); see also *Schumer v. Lab. Computer Sys., Inc.*, 308 F.3d 1304, 1315, 64 USPQ2d 1832, 1841 (Fed. Cir. 2002) ("Typically, testimony concerning anticipation must be testimony from one skilled in the art and must identify each claim element, state the witnesses' interpretation of the claim element, and explain in detail how each claim element is disclosed in the prior art reference."). *Dayco* [**28] filed an expert declaration in the district court urging that the asserted claims of the patents-in-suit were not anticipated because of the failure of the prior art to disclose specific claim limitations. TCI submitted no responsive expert declaration. The district court improperly dismissed *Dayco*'s expert report because "the reference and the claimed invention are easily understandable without the need for expert testimony." *Dayco*, 218 F. Supp. 2d at 1137.

One issue related to anticipation is whether Lusher teaches a polymeric hose as required by claim 1 of the '050 patent. *Dayco*'s expert urged that Lusher failed to disclose a polymeric hose. In granting summary judgment, the district court did not address this issue. On appeal, TCI admits that the reference fails to expressly

state that the hose 18 of Lusher is a polymeric hose. Instead, TCI asserts that "it is inherent from Figure 2 that the inner corrugated hose was made from a synthetic (i.e. polymeric) material." (Appellee's Br. at 44.) There is no support on the record before us for the proposition that Lusher (filed September 27, 1939), necessarily disclosed the use of a polymeric material. "To serve [**29] as an anticipation when the reference is silent about the asserted inherent characteristic, such gap in the reference may be filled with recourse to extrinsic evidence[; however, such evidence must make clear that the missing descriptive matter is necessarily present in the thing described in the reference." *Cont'l Can Co. USA v. Monsanto Co.*, 948 F.2d 1264, 1268, 20 USPQ2d 1746, 1749 (Fed. Cir. 1991) (emphasis added). TCI has cited to no evidence that this missing element was necessarily present.

Thus, the district court erred in concluding that Lusher teaches each and every limitation of claim 1. We, therefore, set aside the grant of summary judgment of invalidity as to claim 1 of the '050 patent based on Lusher.

B. The Titeflex Publication

With respect to the Titeflex Publication, the court concluded: "every element of each of the asserted claims is found in the 1976 publication for the Titeflex Chemical Transfer Hose No. R292 ('Titeflex')." *Dayco*, 218 F. Supp. 2d at 1137. *Dayco*'s expert urged that the Titeflex publication failed to teach "an insert means that is radially outwardly expandable." (J.A. at 1572-73.) The district court, [**30] however, did not address the asserted distinction.

TCI supports the district court holding by arguing on appeal that "based on the Titeflex illustration, one of ordinary skill in the art would recognize that it is inherent that the insert would be radially outwardly expanded." (Appellee's Br. at 48.) In support of this statement, TCI cites the report of its expert, which simply asserts that the Titeflex Publication discloses "[a] cutaway of the hose [which] shows a coupling with an insert means disposed in one end of the tubular hose and inherently being radially outwardly expanded or the hose being radially inwardly compressed into scaling relation with said inner corrugated hose." (J.A. at 1385) (emphasis added). The statement provided in TCI's expert's report does not provide any evidence to support the position that the structure disclosed is necessarily outwardly expanded.

Quite to the contrary, the expert notes that instead the hose may be [*1370] inwardly compressed. The unsupported and equivocal statement of TCI's expert cannot support the district court's grant of summary judgment, which must, therefore, be set aside.

C. The Scovill Coupling

The final piece of prior art [*31] relied upon by the district court when granting summary judgment was the Scovill Model 520-H coupling, which was applied solely to the claims of the '822 patent. The reason the Scovill 520-H coupling was applied solely to the claim of the '822 patent was the district court's claim construction, which provided that "the claims of the '822 patent do not include a hose." *Dayco*, 218 F. Supp. 2d at 1137 (emphasis in original). This claim construction was purportedly based on this court's opinion in *Dayco I*, *Id.* at 13 (citing *Dayco I*, 258 F.3d at 1322, 59 USPQ2d at 1493). In the Background section of *Dayco I*, this court discussed the differences in language between the independent claims of the patents-in-suit, noting:

The '822 patent is different in that instead of claiming a "hose construction," it claims "a coupling for a hose construction" with "projections of said insert means being adapted to be respectively received in said recesses of said inner hose and said projections of said inner hose being adapted to be respectively received in said recesses of said insert means."

258 F.3d at 1322, 59 USPQ2d at 1493 [*32] (emphasis in original). The court was not purporting to determine whether specific claim language would not be part of the claim as properly construed. The body of claim 1 recites "said inner peripheral surface means of said hose comprises an inner corrugated hose made of polymeric material having inwardly directed projections with recesses therebetween and extending from said one end of said (tubular hose to the other end thereof)." '822 patent, claim 1 (emphasis added). Thus, the hose is expressly recited in the body of the claim and was improperly read out of the claim by the district court. The district court's claim construction was in error, as was its summary judgment grant of anticipation based thereon.

III. Impermissible Grouping of Claims

Finally, we hold that the district court committed error by not addressing claim validity on an individual basis. In granting summary judgment, the district court stated that:

The Court finds that every element of the asserted claims in the '752, '822, '050, and '023 patents is found in the 1941 prior art U.S. Patent 2,268,142 ("Lusher '142"). Similarly, every element of each of the asserted claims is found in the 1976 publication [*33] for the Titeflex Chemical Transfer Hose No. R292 ("Titeflex"). . . . Every element of the claimed '822 coupling is shown in the prior art, namely the Scovill 520-H coupling.

Dayco, 218 F. Supp. 2d at 1137. This grouping of claims is contrary to law, which requires that "each claim of a patent (whether in independent, dependent, or multiple dependent form) shall be presumed valid independently of the validity of other claims; [and] dependent or multiple dependent claims shall be presumed valid even though dependent upon an invalid claim." 35 U.S.C. § 282 (2000). The burden of proving the invalidity of the claims was on the defendant. See, e.g., *Abbott Labs. v. Geneva Pharms., Inc.*, 182 F.3d 1315, 1318, 51 USPQ2d 1307, 1309 (Fed. Cir. 1999). To be sure, it is permissible to group claims together for disposition where resolution involves the same issues of validity; however, the justification for such grouping is possible only where those issues are substantially materially identical. Where claims differ in scope in an [*1371] aspect material to the analysis, those claims must be addressed individually.

On appeal, TCI [*34] argues that all of the asserted independent claims are invalid for the same reason that claim 1 of the '050 patent is invalid. (Appellee's Br. at 39.) We have held that the finding of anticipation of claim 1 on summary judgment was erroneous. Even if claim 1 were invalid, TCI's theory would not be sustainable. TCI cites for its theory the court's decision in *Dayco I*, 258 F.3d at 1321, 59 USPQ2d at 1492, in which we stated that "independent claim 1 of the '050 patent is representative of the claims in suit in most respects." (Appellee's Br. at 39.) This statement in the Background section of our prior opinion did not absolve TCI from the statutory requirement to prove the invalidity of each claim independently. *Dayco I* was decided in the context

of claim construction, wherein identical language in different claims is grouped together in view of the rule that if a claim term appears in more than one claim it should be construed the same in each. *CT Beta Ventures, Inc. v. Tura I.P.*, 112 F.3d 1146, 1159, 42 USPQ2d 1577, 1586 (Fed. Cir. 1997) cert. denied, *Marchon Eyewear v. Tura I.P.*, 522 U.S. 1109, 140 L. Ed. 2d 105, 118 S. Ct. 1039 (1998). [*35] The grouping of recitations in different claims for the purpose of claim construction does not permit the grouping of claims, each independently possessing a presumption of validity, for disposition of their validity.

Here, there are seven independent and twenty-six dependent claims in four separate patents. These claims are not materially identical for the purpose of determining their validity. For example, Dayco's expert urged that: claim 2 of the '050 patent was materially different because it required that the projections of the hose be "annular"; claim 10 of the '050 was materially different because it required a "rotatable nut means"; and all of the asserted claims of the '752 patent were materially different because they required "inwardly convex projections."

For these reasons, the grant of summary judgment of invalidity as to claims not individually addressed by the district court must be set aside.

IV. Remand

This is the second time that we have reversed a grant of summary judgment in favor of the defendant. The time has come when this case must be set for trial. In that connection, we note that this case is complex, involving as it does multiple patents, multiple claims, [*36] and

defenses and counterclaims of unenforceability and invalidity. On remand counsel for both parties have an obligation to cooperate in narrowing the issues, and avoiding untenable arguments, which serve only to confuse the real issues before the district court. On the present record there is no basis for a claim of unenforceability concerning the failure to disclose the copendency of the '96 application or the Wilson patent, nor is there any basis for a claim of invalidity of the asserted claims as being anticipated under 35 U.S.C. § 102 given the presumption of validity that applies to all patents. Absent the discovery of material new evidence the court should entertain summary judgment motions by plaintiff to dispose of these claims.

CONCLUSION

We conclude that a trial is required on the issue of infringement. The standards for claim interpretation are those set forth in this opinion and our earlier opinion in *Dayco I*, 258 F.3d at 1324-25, 57 USPQ2d at 1494-95. Further, invalidity under 35 U.S.C. § 103 for obviousness should be resolved at trial, as should the issue of inequitable conduct related to the failure to [*37] disclose the rejection of substantially [*1372] similar claims in a copending application. The district court should determine whether any material new evidence is provided that requires a trial on the issue of anticipation or other issues of inequitable conduct.

VACATED AND REMANDED

COSTS

Costs to appellant.

LEXSEE 30 F.3D 1475

IN RE DAVID C. PAULSEN

94-1012

UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

30 F.3d 1475; 1994 U.S. App. LEXIS 19882; 31 U.S.P.Q.2D (BNA) 1671

August 3, 1994, Decided

PRIOR HISTORY: [*1] Appealed from: United States Patent and Trademark Office Board of Patent Appeals and Interferences. (Reexamination Nos. 90/002,014, 90/002,053, and 90/002,179)

DISPOSITION: AFFIRMED.

COUNSEL: J. Georg Secka, Attorney, Townsend and Townsend Khourie and Crew, of San Francisco, California, argued for appellant.

Harris Pitlick, Attorney, Commissioner of Patents and Trademarks, of Arlington, Virginia, argued for appellee. With him on the brief was Fred E. McKelvey.

JUDGES: Before NIES, MICHEL, and LOURIE, Circuit Judges.

OPINION BY: LOURIE

OPINION

[*1477] LOURIE, *Circuit Judge*.

AST Research, Inc. (AST) ¹ appeals from the July 23, 1993 decision of the United States Patent and Trademark Office (PTO) Board of Patent Appeals and Interferences sustaining the final rejection upon reexamination of claims 1-4, 6, 9-12, and 18-34 of *U.S. Patent 4,571,456*. We affirm.

1 AST Research is the current record owner of the patent in issue.

[*1478] **BACKGROUND**

The '456 patent, entitled "Portable Computer," was

issued to David C. Paulsen et al., on February 18, 1986. The claims of the patent are directed [*2] to a portable computer contained within a compact metal case. ² A salient feature of the claimed invention is its "clam shell" configuration, in which the computer's display housing is connected to the computer at its midsection by a hinge assembly that enables the display to swing from a closed, latched position for portability and protection to an open, erect position for viewing and operation. Computers consistent with this design are commonly referred to as "laptop" computers.

2 Claim 1 is the broadest claim in the '456 patent and is illustrative of the claimed invention. The claim reads as follows:

1. A portable computer constructed to be contained within an outer case for transport and to be erectable to a viewing and operating configuration for use, said computer comprising

a base,

a display housing,

a top cover,

a rear cover,

hinge means for permitting swinging movement of the display housing about an axis of rotation adjacent the rear end of the display

housing and from a closed and latched position of the display housing on the base to an erected position for viewing by an operator, and including stop means for holding the display housing at the desired angle for viewing.

the hinge means being located in a mid portion of the base and wherein the hinge means permit swinging movement of the display housing to an erected position in which the inner surface of the display housing is held in an upward and rearwardly inclined angle for viewing by an operator in front of the computer, and

including a keyboard in the portion of the base which is exposed by the movement of the display housing to the erected position.

[**3] On April 27, 1990, and subsequently on June 12, 1990 and October 22, 1990, requests were filed in the PTO for reexamination of the '456 patent. See 35 U.S.C. § 302 (1988). The requests were consolidated into a single proceeding for the reexamination of claims 1 through 34.³ On August 9, 1991, the examiner issued a final office action in the reexamination rejecting claims 1-4, 6, 7, 9-12, and 18-34. Independent claims 1 and 18 were rejected under 35 U.S.C. § 102(b) (1988) as being anticipated by Japanese Application 47-14961 to Yokoyama. Additionally, claims 1-4, 6, 7, 9-12, and 18-34 were rejected under 35 U.S.C. § 103 (1988) as being obvious over the Yokoyama reference in view of other prior art.⁴

3 As originally issued, the '456 patent contained claims 1 through 19. New claims 20 through 34 were subsequently added during reexamination.

4 Claims 5, 8, and 13-17 were allowed by the examiner in the reexamination proceeding. These claims are not at issue in this appeal.

[**4] On appeal, the Board affirmed the examiner's rejections except as to claim 7. In sustaining the rejections of claims 1 and 18, the Board rejected the

appellant's⁵ contention that Yokoyama is not a proper prior art reference under sections 102 or 103. The Board concluded that although Yokoyama discloses a calculator, a calculator is a type of computer. The Board also rejected the appellant's argument that Yokoyama is a non-enabling reference. Respecting the § 103 rejection of claims 2-4, 6, 9-12, and 19-34, the Board adopted the examiner's determination that the cited prior art would have suggested the claim subject matter to a person of ordinary skill in the art.⁶

5 The party in interest during the reexamination proceeding was Grid Systems Corp., the original assignee of the '456 patent.

6 Because the Board adopted the examiner's position as its own, we shall refer to the examiner's findings and conclusions as those of the Board.

AST, the present assignee of the '456 patent, now appeals from the Board's [**5] decision.

DISCUSSION

Claims 1 and 18

We first address AST's challenge to the Board's determination that claims 1 and 18 are anticipated by the Yokoyama reference. Anticipation is a question of fact subject to review under the "clearly erroneous" standard. *In re King*, 801 F.2d 1324, 1326, 231 USPQ 136, 138 (Fed. Cir. 1986). A rejection for anticipation under section 102 requires that each and every limitation of the claimed invention be disclosed in a single [*1479] prior art reference. *In re Spada*, 911 F.2d 705, 708, 15 USPQ2d 1655, 1657 (Fed. Cir. 1990). In addition, the reference must be enabling and describe the applicant's claimed invention sufficiently to have placed it in possession of a person of ordinary skill in the field of the invention. *Id.*

The Yokoyama reference discloses a desktop calculator contained within a housing having the form of a portable attache case. The front half of the case consists of a lid that is hinged at the midsection of the case. Connected to the inside of the lid is a display which is able to be viewed when the lid is opened to a vertical position. A keyboard [**6] is also exposed for operation when the lid is opened. When the device is to be transported, the lid is closed and latched to protect the display and the keyboard. Notwithstanding that

Yokoyama discloses a device meeting the express limitations set out in claims 1 and 18 relating to a base, a display housing, a keyboard, etc., AST maintains that the claims are not anticipated by Yokoyama because that reference discloses a calculator, not a computer. ⁷ AST contends that the Board erred in construing the term "computer" broadly to encompass a calculator such as that disclosed in Yokoyama.

7 AST does not dispute that all the limitations of claims 1 and 18 are otherwise described in the Yokoyama reference.

We note at the outset that the term "computer" is found only in the preamble of the claims at issue. The preamble of a claim does not limit the scope of the claim when it merely states a purpose or intended use of the invention. See *DeGeorge v. Bernier*, 768 F.2d 1318, 1322 n.3, 226 USPQ 758, 761 n.3 (Fed. Cir. 1985). [*7] However, terms appearing in a preamble may be deemed limitations of a claim when they "give meaning to the claim and properly define the invention." *Gerber Garment Technology, Inc. v. Lectra Sys., Inc.*, 916 F.2d 683, 688, 16 USPQ2d 1436, 1441 (Fed. Cir. 1990) (quoting *Perkin-Elmer Corp. v. Computervision Corp.*, 732 F.2d 888, 896, 221 USPQ 669, 675 (Fed. Cir.), cert. denied, 469 U.S. 857, 83 L. Ed. 2d 120, 105 S. Ct. 187 (1984)). Although no "litmus test" exists as to what effect should be accorded to words contained in a preamble, review of a patent in its entirety should be made to determine whether the inventors intended such language to represent an additional structural limitation or mere introductory language. *Corning Glass Works v. Sumitomo Elec. U.S.A., Inc.*, 868 F.2d 1251, 1257, 9 USPQ2d 1962, 1966 (Fed. Cir. 1989); *In re Stencel*, 828 F.2d 751, 754, 4 USPQ2d 1071, 1073 (Fed. Cir. 1987).

In the instant case, review of the '456 patent [**8] as a whole reveals that the term "computer" is one that "breathes life and meaning into the claims and, hence, is a necessary limitation to them." *Loctite Corp. v. Ultraseal Ltd.*, 781 F.2d 861, 866, 228 USPQ 90, 92 (Fed. Cir. 1984). Thus, to anticipate claims 1 and 18, the Yokoyama reference must disclose a type of "computer." See *Diversitech Corp. v. Century Steps, Inc.*, 850 F.2d 675, 678, 7 USPQ2d 1315, 1317 (Fed. Cir. 1988) (prior art reference must contain preamble limitations). However, to properly compare Yokoyama with the claims at issue, we must construe the term "computer" to ascertain its scope and meaning. Claim construction is a legal

question that we address *de novo*. See *Carroll Touch, Inc. v. Electro Mechanical Sys., Inc.*, 15 F.3d 1573, 1577, 27 USPQ2d 1836, 1839 (Fed. Cir. 1993).

Pursuant to its practice of giving claims in a reexamination their broadest reasonable interpretation consistent with the specification, see *In re Etter*, 756 F.2d 852, 858, 225 USPQ 1, 5 (Fed. Cir. 1985), the [**9] Board construed the term "computer" to include a calculator. The Board's interpretation was supported by authoritative lexicographic sources that confirmed that a calculator is considered to be a particular type of computer by those of ordinary skill in the art. AST alleges that the Board's interpretation was erroneous because it ignores the inventors' own definition of "computer." AST asserts that the specification plainly indicates that the inventors intended to limit the claimed invention to a device having a display with graphics and text capability, sufficient data processing capacity, communication ports, a telephone connection. [*1480] etc., features normally absent in a calculator.

In an effort to avoid the anticipating disclosure of Yokoyama, AST engages in a *post hoc* attempt to redefine the claimed invention by impermissibly incorporating language appearing in the specification into the claims. Although "it is entirely proper to use the specification to interpret what the patentee meant by a word or phrase in the claim, . . . this is not to be confused with adding an extraneous limitation appearing in the specification, which is improper. By 'extraneous,' we mean a limitation [**10] read into a claim from the specification wholly apart from any need to interpret . . . particular words or phrases in the claim." *E.I. Du Pont de Nemours & Co. v. Phillips Petroleum Co.*, 849 F.2d 1430, 1433, 7 USPQ2d 1129, 1131 (Fed. Cir.), cert. denied, 488 U.S. 986, 102 L. Ed. 2d 572, 109 S. Ct. 542 (1988). Moreover, when interpreting a claim, words of the claim are generally given their ordinary and accustomed meaning, unless it appears from the specification or the file history that they were used differently by the inventor. See *Carroll Touch*, 15 F.3d at 1577, 27 USPQ2d at 1840.

The term "computer" is not associated with any one fixed or rigid meaning, as confirmed by the fact that it is subject to numerous definitions and is used to describe a variety of devices with varying degrees of sophistication and complexity. However, despite the lack of any standard definition for this ubiquitous term, it is

commonly understood by those skilled in the art that "at the most fundamental level, a device is a computer if it is capable of [*11] carrying out calculations." *National Advanced Sys., Inc. v. United States*, 26 F.3d 1107, slip op. at 10 (Fed. Cir. 1994). AST cannot dispute that a calculator falls within that basic definition. That a calculator may be a "limited function" computer as opposed to a "full function" computer does not change the fact that it is nonetheless a computer.⁸

8 We are unpersuaded by the declarations submitted by the appellants which draw a distinction between a calculator and a computer based on comparative functions and capabilities. As the Board correctly concluded, such extrinsic evidence fails to rebut the premise that a calculator is a computer, albeit one with limited functions.

Although an inventor is indeed free to define the specific terms used to describe his or her invention, this must be done with reasonable clarity, deliberateness, and precision. "Where an inventor chooses to be his own lexicographer and to give terms uncommon meanings, he must set out his uncommon definition in some manner within [*12] the patent disclosure" so as to give one of ordinary skill in the art notice of the change. See *Intellect, Inc., v. Phonometrics, Inc.*, 952 F.2d 1384, 1387-88, 21 USPQ2d 1383, 1386 (Fed. Cir. 1992). Here, the specification of the '456 patent does not clearly redefine the term "computer" such that one of ordinary skill in the art would deem it to be different from its common meaning. The specification merely describes in a general fashion certain features and capabilities desirable in a portable computer. This description, however, is far from establishing a specialized definition restricting the claimed invention to a computer having a specific set of characteristics and capabilities.

We conclude that the Board did not clearly err in determining that the Yokoyama reference meets all the limitations of claims 1 and 18 as properly construed, including the "computer" limitation.

Alternatively, AST asserts that Yokoyama does not anticipate claims 1 and 18 because it is not enabling. AST argues that Yokoyama only discloses a box for a calculator and thus does not teach how to make and use a portable calculator. This argument, however, fails [*13] to recognize that a prior art reference must be "considered together with the knowledge of one of ordinary skill in

the pertinent art." *In re Samour*, 571 F.2d 559, 562, 197 USPQ 1, 3-4 (CCPA 1978); see also *DeGeorge*, 768 F.2d at 1323, 226 USPQ at 762 (Fed. Cir. 1985) (a reference "need not, however, explain every detail since [it] is speaking to those skilled in the art"). As the Board found below, the level of skill to which Yokoyama is addressed was "quite advanced" at the time the '456 patent was filed and that "one of ordinary skill in the art [*1481] certainly was capable of providing the circuitry necessary to make the device operable for use as a computer." We discern no clear error in the Board's findings and conclude as a matter of law that Yokoyama is sufficiently enabling to serve as a section 102(b) reference.⁹ See *Could v. Quigg*, 822 F.2d 1074, 1077, 3 USPQ2d 1302, 1303-04 (Fed. Cir. 1987) (ultimate issue of enablement is one of law based on underlying factual findings).

9 We also note that under the enablement standard that AST would have us apply to Yokoyama, the '456 patent itself would be non-enabling. The '456 patent similarly relies on the knowledge and skill of those skilled in the art. If detailed disclosure regarding implementation of known electronic and mechanical components necessary to build a computer were essential for an anticipating reference, then the disclosure in the '456 patent would also fail to satisfy the enablement requirement. See *Constant v. Advanced Micro-Devices, Inc.*, 848 F.2d 1560, 1569, 7 USPQ2d 1057, 1063 (Fed. Cir. 1988).

[*14] Accordingly, we affirm the Board's rejection of claims 1 and 18 as being anticipated by Yokoyama. As a result, we need not review the obviousness rejections of these claims. See *In re Baxter Travenol Labs*, 952 F.2d 388, 391, 21 USPQ2d 1281, 1285 (Fed. Cir. 1992) ("Since anticipation is the ultimate of obviousness, the subject matter of these claims is necessarily obvious and we need not consider them further."). Additionally, because AST does not argue the patentability of claims 9-12 and 19-27 separately from that of claims 1 and 18, the appeal of these claims also fails. See *In re Albrecht*, 579 F.2d 92, 93-94, 198 USPQ 208, 209 (CCPA 1978); *In re King*, 801 F.2d at 1325, 231 USPQ at 137.

Claims 2-4, 6, and 28-34

Next, AST challenges the Board's rejection of claims 2-4, 6, and 28-34 on the ground of obviousness. Obviousness is a question of law to be determined from the facts. *In re Fine*, 837 F.2d 1071, 1073, 5 USPQ2d

1596, 1598 (Fed. Cir. 1988). Thus, the Board's conclusion of obviousness is reviewed [*15] for error as a matter of law. *In re De Blauwe*, 736 F.2d 699, 703, 222 USPQ 191, 195 (Fed. Cir. 1984), and underlying factual inquiries are reviewed for clear error. *In re Caveney*, 761 F.2d 671, 674, 226 USPQ 1, 3 (Fed. Cir. 1985).

1. Non-Analogous Art

AST argues that claims 2, 6, and 28-34, which add particular features to the hinge and latch means of the display housing,¹⁰ were erroneously rejected over non-analogous references directed to hinges and latches as used in a desktop telephone directory, a piano lid, a kitchen cabinet, a washing machine cabinet, a wooden furniture cabinet, or a two-part housing for storing audio cassettes. AST maintains that because the references pertain to fields of endeavor entirely unrelated to computers and are not pertinent to the problems faced by the present inventors, they do not render the claims obvious. It argues that the cited references, dealing with such articles as cabinets and washing machines, do not deal with the particular environment presented in portable computers. This argument rests on too narrow a view of what prior art is pertinent [*16] to the invention here.

¹⁰ Generally, claims 2 and 6, both depending from claim 1, recite torsion spring means and recessed latch means for the display housing, respectively. Claims 28, 29, 30, 33, and 34 are directed to a portable computer having concealed hinges, and claims 31 and 32 recite recessed latch means and retractable legs, respectively.

Whether a prior art reference is "analogous" is a fact question that we review under the "clearly erroneous" standard. *In re Clay*, 966 F.2d 656, 658, 23 USPQ2d 1058, 1060 (Fed. Cir. 1992). Although there is little dispute that the prior art references cited here (other than Yokoyama) are not within the same field of endeavor as computers, such references may still be analogous if they are "reasonably pertinent to the particular problem with which the inventor is involved." *Id.*; see also *Heidelberger Druckmaschinen AG v. Hantscho Commercial Prods., Inc.*, 21 F.3d 1068, 1072, 30 USPQ2d 1377, 1379 (Fed. Cir. 1994). [*17] The problems encountered by the inventors of the '456 patent were problems that were not unique to portable computers. They concerned how to connect and secure the computer's display housing to the computer while

meeting certain size constraints [*1482] and functional requirements. The prior art cited by the examiner discloses various means of connecting a cover (or lid) to a device so that the cover is free to swing radially along the connection axis, as well as means of securing the cover in an open or closed position. We agree with the Board that given the nature of the problems confronted by the inventors, one of ordinary skill in the art "would have consulted the mechanical arts for housings, hinges, latches, springs, etc." Thus, the cited references are "reasonably pertinent" and we therefore conclude that the Board's finding that the references are analogous was not clearly erroneous.

2. Secondary Considerations

In support of its contention that the Board erred in rejecting claims 2-4, 6, and 28-34 as obvious, AST points to evidence of commercial success, copying, and professional recognition of Grid laptop computers, devices covered by claims 1 and 18 of the '456 patent. For example, [*18] from the introduction of their laptop computers in 1983 to the end of 1990, Grid enjoyed cumulative sales of approximately \$ 489 million in addition to licensing royalties of \$ 7.5 million. Grid also received several design awards and exceptional praise from the industry press.

Although such evidence is indeed impressive, AST has not shown that it is relevant to the claims at issue and thus entitled to weight. When a patentee offers objective evidence of nonobviousness, there must be a sufficient relationship between that evidence and the patented invention. See *Demaco Corp. v. F. Von Langsdorff Licensing Ltd.*, 851 F.2d 1387, 1392, 7 USPQ2d 1222, 1226 (Fed. Cir.), cert. denied, 488 U.S. 956, 102 L. Ed. 2d 383, 109 S. Ct. 395 (1988). "The term 'nexus' is used, in this context, to designate a legally and factually sufficient connection between the proven success and the patented invention, such that the objective evidence should be considered in the determination of nonobviousness. The burden of proof as to this connection or nexus resides with the patentee." *Id.* Here, AST [*19] has failed to carry its burden.

AST limits its argument respecting the evidence adduced to demonstrate nonobviousness to laptop computers covered by claims 1 and 18, claims which we have previously concluded are unpatentable under section 102.¹¹ AST has not established that the commercial success, copying, and professional recognition

experienced by Grid laptop computers are probative of the nonobviousness of the inventions of claims 2-4, 6, and 28-34. It has not been shown that such evidence is relevant to a computer within the scope of these claims, i.e., that it is attributable to the inventions of these claims, rather than to extraneous factors such as advertising and marketing or to the features possessed by the computers of claims 1 and 18. Because AST has failed to establish a sufficient legal relationship between the purported evidence of nonobviousness and the claimed invention, evidence pertinent to claims 1 and 18 therefore carries no weight with respect to claims 2-4, 6, and 28-34.

11 The only evidence connecting the purported commercial success and professional praise with the '456 patent is the declaration of J. Georg Seka, counsel for AST, stating that claims 1 and 18 cover the Grid "Compass" laptop computer and certain models made by Toshiba. Even assuming that a nexus exists as to those two claims, evidence of nonobviousness is irrelevant for patentability purposes when an invention is anticipated under *section 102*.

[**20] 3. Obviousness Generally

Beyond what we have said respecting the applicability of the cited prior art and the asserted evidence of secondary considerations, we have

considered AST's basic contention that the prior art does not suggest the invention of the rejected claims and view it to be unpersuasive. In reviewing the Board's obviousness conclusions, we have been guided by the well-settled principles that the claimed invention must be considered as a whole, multiple cited prior art references must suggest the desirability of being combined, and the references must be viewed without the benefit of hindsight afforded by the disclosure. See *Hodosh v. Block Drug Co., Inc.*, 786 F.2d 1136, 1143 n.5, 229 USPQ 182, 187 n.5 (Fed. Cir.), cert. denied, 479 U.S. 827, 107 S. Ct. 106, 93 [*1483] 1, Fed. 2d 55 (1986). We have carefully reviewed the prior art of record and conclude that the Board did not err in rejecting claims 2-4, 6, and 28-34 as having been obvious.

CONCLUSION

The Board did not clearly err in rejecting claims 1 and 18 as being anticipated by the Yokoyama reference. Consequently, [**21] the rejection of claims 9-12 and 19-27 must also be affirmed. The Board did not err in rejecting claims 2-4, 6, and 28-34 as being obvious over Yokoyama and other prior art. Accordingly, we affirm the decision of the Board.

AFFIRMED

LEXSEE 740 F.2D 1569

IN RE YUJIRO YAMAMOTO, Appellant and DICTAPHONE CORP., Intervenor

No. 84-557

UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

740 F.2d 1569; 1984 U.S. App. LEXIS 15163; 222 U.S.P.Q. (BNA) 934

August 7, 1984

PRIOR HISTORY: [**1] Appealed from: U.S. Patent & Trademark Office Board of Appeals.

COUNSEL: Grover A. Frater, of Santa Fe, California, argued for Appellant.

Thomas E. Lynch, of Arlington, Virginia, argued for Appellee. With him on the brief were Joseph F. Nakamura, Solicitor and Jere W. Scars, Deputy Solicitor.

Gregor N. Neff, of New York, New York, argued for Intervenor. With him on the brief were William S. Frommer, or counsel and Melvin J. Scolnick, of Stamford, Connecticut, of Counsel.

JUDGES: Davis, Baldwin, and Miller, Circuit Judges. Miller, Circuit Judge, concurring in part and dissenting in part.

OPINION BY: BALDWIN

OPINION

[*1570] BALDWIN, Circuit Judge.

This appeal is from a decision of the United States Patent and Trademark Office (PTO) Board of Appeals (board) in a reexamination proceeding involving U.S. Patent No. 3,747,228 (Yamamoto) issued to appellant, Yamamoto. The board affirmed rejection of claims 1-3, 7, and 8 as unpatentable under 35 U.S.C. § 103 over U.S. Patent No. 3,300,586 (Shepard) and of claim 4 over Shepard in view of U.S. Patent No. 3,550,289 (Orita). We affirm.

Procedural History

Appellant filed suit for infringement of the Yamamoto patent in the United [**2] States District Court for the Central District of California against Dictaphone Corporation (Dictaphone). Dictaphone requested reexamination of the patent in suit and is an intervenor in this appeal. The District Court action was stayed pending the outcome of the reexamination proceeding.

The Invention

The Yamamoto patent describes and claims an interview machine. The machine asks a question, records the interviewee's answer, then asks another question. This alternating question and answer sequence is repeated until the interview is completed. The machine detects the continuance and the end of each question. It also detects the continuance and the end of each answer. Using this detected information, the machine determines the timing of questions and the periods allowed for response. The machine may be programmed to repeat a question if no response is given, to go on to the next question, or to terminate the interview. Claim 1 of the patent recites appellant's invention as follows:

1. An interview machine comprising:

a question storage memory adapted for storing a series of questions to be asked of an interviewee, and having associated means for retrieving each [**3] question from the memory and communicating it in audible form to the interviewee;

an answer storage memory adapted for storing a series of answers given by the interviewee;

manually operable means for causing the first question of the series to be communicated to the interviewee; and

timing and control means responsive if the question is not answered within a predetermined period of time for causing the next question of the series to be communicated to the interviewee, and responsive if an answer is initiated within said predetermined period of time for [*1571] delaying the retrieval and communication of the next question until the answer has been completed;

whereby the interviewee upon initiating his answer within said predetermined period of time may give as long an answer as he desires, and upon completion of his answer the machine automatically communicates the next question of the series to him.

The Prior Art

The Shepard patent describes a telephone answering machine. In addition to simply answering the telephone, it asks the caller questions and records answers to those questions. The caller may give an answer for as long as he likes. The [***4] next question will be posed when the previous answer is completed. If a question is not answered within a certain time, the machine automatically asks the next question. The machine described in Shepard is also capable of distinguishing between "YES" and "NO" answers and selecting the next question according to the answer given. In addition, the machine may control the operation of several different tape recorders and telephones simultaneously.

The Orita patent describes a language teaching machine which delivers a series of questions or instructions to headphones worn by students. Students' answers are spoken into a microphone and are recorded one after another in a tape recorder. The student may answer for as long as he or she wants. When an answer is completed, the next question is automatically sent to the headphones.

OPINION

The first issue presented by this appeal is whether the

board adopted the correct standard of claim interpretation in reexamination proceedings. The board said that claims subject to reexamination will "be given their broadest reasonable interpretation consistent with the specification, and limitations appearing in the specification are not to [**5] be read into the claims." In adopting this standard for reexamination proceedings, the board followed *In re Reuter*, 651 F.2d 751, 210 U.S.P.Q. (BNA) 249 (CCPA 1981), where the United States Court of Customs and Patent Appeals approved use of the broadest reasonable interpretation standard in reissue proceedings.

Appellant contends that the adoption of this standard for interpreting claims subject to reexamination was error. Appellant urges us to require the PTO to apply a rule of claim construction adopted by Federal District Courts when the validity of an issued patent is in question. Appellant relies on *Photo Electronics Corp. v. England*, 581 F.2d 772, 199 U.S.P.Q. (BNA) 710 (9th Cir. 1978), where the United States Court of Appeals for the Ninth Circuit described its approach to claim construction in an infringement action in the following manner:

The starting point is the rule that patent claims should be construed liberally to uphold the patent's validity rather than to destroy the inventor's right to protect the substance of his invention

Id. at 776, 199 U.S.P.Q. at 714 (citations omitted). * We affirm the board's decision to give claims [**6] their broadest reasonable interpretation, consistent with the specification, in reexamination proceedings.

* In a district court context, we too have said that claims should be construed, if possible, to sustain their validity. *ACS Hosp. Systems, Inc. v. Montefiore Hosp.*, 732 F.2d 1572, 1577, 221 U.S.P.Q. (BNA) 929, 932 (Fed. Cir. 1984); *Carmen Indus., Inc. v. Wahl*, 724 F.2d 932, 937 n.5, 220 U.S.P.Q. (BNA) 481, 485 n.5 (Fed. Cir. 1983).

The PTO broadly interprets claims during examination of a patent application since the applicant may "amend his claims to obtain protection

commensurate with his actual contribution to the art." *In re Prater*, 36 C.C.P.A. 1381, 415 F.2d 1393, 1404-05, 162 U.S.P.Q. (BNA) 541, 550 (1969). This approach serves the public interest by reducing the possibility that claims, finally allowed, will be given broader scope than is justified. Applicants' interests are not impaired since they are not foreclosed from obtaining appropriate coverage for their invention with express [*7] claim language. *Id.* [*1572] at 1405 n.31, 162 U.S.P.Q. at 550 n.31.

An applicant's ability to amend his claims to avoid cited prior art distinguishes proceedings before the PTO from proceedings in federal district courts on issued patents. When an application is pending in the PTO, the applicant has the ability to correct errors in claim language and adjust the scope of claim protection as needed. This opportunity is not available in an infringement action in district court. District courts may find it necessary to interpret claims to protect only that which constitutes patentable subject matter to do justice between the parties. *Id.* at 1404, 162 U.S.P.Q. at 550.

The same policies warranting the PTO's approach to claim interpretation when an original application is involved have been held applicable to reissue proceedings because the reissue provision, 35 U.S.C. § 251, permits amendment of the claims to avoid prior art. *In re Reuter*, 651 F.2d at 756, 210 U.S.P.Q. at 253-54. The reexamination law, set forth below, gives patent owners the same right:

In any reexamination proceeding under this chapter, the patent owner will be permitted to propose [*8] any amendment to his patent and a new claim or claims thereto, in order to distinguish the invention as claimed from the prior art cited under the provisions of section 301 of this title, or in response to a decision adverse to the patentability of a claim of a patent. No proposed amended or new claim enlarging the scope of a claim of the patent will be permitted in a reexamination proceeding under this chapter.

35 U.S.C. § 305 (1982).

Appellant therefore had an opportunity during reexamination in the PTO to amend his claims to correspond with his contribution to the art. The reasons underlying the PTO's interpretation of the claims in reissue proceedings therefore justify using the same approach in reexamination proceedings.

On the merits of claim 1, the board correctly concluded that the Shepard patent exactly corresponds to appellant's claim except for the following feature: "an answer storage memory adapted for storing a series of answers given by the interviewee." This is also, in our view, the only difference between Shepard and claims 2, 3, 7, and 8.

Appellant argues this language of claim 1 requires all of the answers to be stored one after another and [*9] that they be stored in that form indefinitely. Shepard discloses recording each answer on a magnetic tape. It is not clear from Shepard whether the answer is permanently stored or whether it is erased after use. The board found that Shepard teaches a means for storing the answers for later use if desired. Specifically, according to Shepard, a caller may be invited to leave a name and telephone number to permit completion of any desired business. From this the board inferred, appropriately in our view, that one of ordinary skill in the art reading Shepard would have understood the advantages of recording and storing answers and how to do it. The board concluded that storing the answers in a series, one answer after another, would have been within the ability of a person of ordinary skill in the art. Claims 2 and 7 are the only other independent claims in the application. Appellant has not identified any other differences between claims 2, 3, 7, or 8, and the Shepard patent that would require overturning the board's decision.

The board rejected claim 4 over the combined teachings of Shepard and Orita. At issue here is the means used to stop the storage tape drive when a question [*10] is completed. Claim 4, which is dependent on claim 2, requires:

a first timer coupled to the output of said first signal presence detector, . . . the outputs of said first and second timers being coupled to said drive means for respectively stopping or starting the question storage tape

Shepard does not use a timer to stop a question storage tape drive after a question is transmitted. Orita, however, does teach this feature. Orita teaches using a timer in the form of an integrating circuit in conjunction with a Schmidt trigger to [*1573] automatically stop the instructional tape recorder when one of the instructional programs ends. An oral response (or answer) to the instruction program is then recorded on the practice tape recorder. Another timer detects the end of the answer and causes the practice tape recorder to turn off and the instructional tape recorder to turn on and deliver the next instruction. We agree with the board that this teaching provides evidence that Yamamoto's inclusion of a timer to shut off the question storage tape after a question has been transmitted would have been obvious to one of ordinary skill in the art.

Although [*11] appellant argues that adding Orita's timer to the Shepard device would make the device inoperable, we have said before that a claim may have been obvious in view of a combination of references even if the features of one reference cannot be substituted physically into the structure of the other references. *In re Sneed*, 710 F.2d 1544, 1550, 218 U.S.P.Q. (BNA) 385, 389 (Fed. Cir. 1983); *Orthopedic Equipment Co. v. United States*, 702 F.2d 1005, 1013, 217 U.S.P.Q. (BNA) 193, 200 (Fed. Cir. 1983).

Appellant also argues the patentability of claims 9-11. However, we agree with the solicitor's contention that claims 9-11 have been abandoned. The examiner originally indicated claims 9-11 were allowable. After considering appellant's appeal on the rejected claims, the board remanded the application to the examiner recommending that claims 9-11 be rejected under 35 U.S.C. § 103. The board further required the case to be returned to the board, after proceedings were completed on remand, so the board could either adopt its earlier decision as final or enter a new decision. 37 C.F.R. § 1.196(d) (1983). The board set a one month period for appellant to make an appropriate amendment [*12] or showing of facts, or both, to overcome the rejection.

Appellant did not respond within the one-month period. The examiner restated the rejection and gave appellant an additional month to respond. Appellant did not respond to the rejection nor did he appeal to the board from the rejection. The case was then returned to the board for final action. As the regulation permits, the board, without comment and without argument, affirmed rejection of all claims. Since appellant neither responded to the rejection of claims 9-11 before the primary examiner nor appealed the rejection to the board, claims 9-11 are treated as having been abandoned. *See* 37 C.F.R. § 1.196(d); *id.* § 1.550(d).

For the foregoing reasons, the board's decision is affirmed.

AFFIRMED.

CONCUR BY: MILLER (In Part)

CONCUR

MILLER (In Part)

DISSENT

MILLER, Circuit Judge, concurring in part and dissenting in part.

I dissent with respect to claim 4, the obviousness of which is not supported by Shepard in view of Orita. Indeed, stopping Shepard's question tape drive in accordance with Orita would stop the answer recording tape, and, without a recorded answer, the next question would not be asked. The "bodily" [*13] incorporation" point made by the majority opinion is not responsive to appellant's position that the operation of the devices of Orita and Shepard is so different that one of ordinary skill in the art would not view this as a natural and logical combination. *In re Walker*, 54 C.C.P.A. 1235, 374 F.2d 908, 913, 153 U.S.P.Q. (BNA) 180, 185 (1967).

LEXSEE 893 F.2D 319

IN RE ALEX ZLETZ

No. 89-1093

UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

893 F.2d 319; 1989 U.S. App. LEXIS 19432; 13 U.S.P.Q.2D (BNA) 1320

December 27, 1989, Decided

SUBSEQUENT HISTORY: [*1] Rehearing Denied February 7, 1990. Reported at: *1990 U.S. App. LEXIS 1904*.

PRIOR HISTORY: Appealed from: United States Patent and Trademark Office Board of Patent Appeals and Interferences.

DISPOSITION: AFFIRMED.

COUNSEL: Wallace L. Oliver, Amoco Corporation, of Chicago, Illinois, argued for Appellant. With him on the brief were Ralph C. Medhurst and William H. Magidson.

Fred E. McKelvey, Solicitor, Office of the Solicitor, of Arlington, Virginia, argued for Appellee. With him on the brief were Richard E. Schafer and John W. Dewhurst, Associate Solicitors.

Harry J. Roper, George S. Bosy and Nicholas A. Poulos, Neuman, Williams, Anderson & Olson, of Chicago, Illinois, were on the brief for Amicus Curiae, Phillips Petroleum Company.

JUDGES: Markey, Chief Judge, Newman and Michel, Circuit Judges.

OPINION BY: NEWMAN

OPINION

[*320] NEWMAN, Circuit Judge.

Dr. Alex Zletz appeals the decision of the United States Patent and Trademark Office (PTO) Board of Patent Appeals and Interferences, Appeal No. 88-1655

(August 31, 1988), rejecting claims 13 and 14, the only claims remaining in patent application Serial No. 03/462,480, filed October 15, 1954. We affirm.

Background

[**2] The history of Patent Interference No. 89,634, called the "polypropylene" interference, has been recorded elsewhere, see *Standard Oil Co. (Indiana) v. Montedison S.p.A.*, 494 F. Supp. 370, 206 U.S.P.Q. (BNA) 676 (D.Del. 1980), *aff'd*, 664 F.2d 356, 212 U.S.P.Q. (BNA) 327 (3d Cir. 1981), *cert. denied*, 456 U.S. 915, 215 U.S.P.Q. (BNA) 95, 72 L. Ed. 2d 174, 102 S. Ct. 1769 (1982), and is adequately described therein to the extent pertinent to this case. The single count of that interference was as follows:

Normally solid polypropylene, consisting essentially of recurring propylene units, having a substantial crystalline polypropylene content.

Priority was awarded adversely to Zletz (assignor to Standard Oil Company (Indiana), now known as Amoco Corporation), one of five parties to the interference, and in favor of Hogan *et al.*, assignors to Phillips Petroleum Company.¹ Reference hereinafter to the "lost count" of the interference is to the above text.

1 Phillips Petroleum Company has filed a brief as *amicus curiae*, supporting the Board's decision herein.

[**3] Dr. Zletz, having lost the priority contest, returns his patent application to *ex parte* prosecution, in

accordance with the rules. The claims at issue in the Zletz patent application are:

13. Normally solid polypropylene having a crystalline polypropylene content.

14. Normally solid polypropylene.

Zletz asserts that claims 13 and 14 are independently patentable to him, in that they are different from the lost count and are supported by work that predates any reference against him. The references are the Hogan *et al.* and Bavier patents issued on two of the other patent applications in the interference, which are references as of [*321] their filing dates under 35 U.S.C. § 102(e); and the lost count, which is a reference as of the invention date awarded to the prevailing party in the interference, in accordance with 35 U.S.C. § 102(g).² Zletz provided affidavit evidence under Rule 131 (37 C.F.R. § 1.131) to show that the experimental work on which he relies predates these reference dates; he also relies on the disclosures of his parent patent applications filed in 1951 and 1952.

2 35 U.S.C. § 102: A person shall be entitled to a patent unless --

...

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent. ... or

...

(g) before the applicant's invention thereof the invention was made in this country by another who had not abandoned, suppressed, or concealed it.

[**4] The examiner found that Zletz's early work was directed to a species of copolymer that was patentably distinct from the subject matter of the lost count of the interference, but that Zletz had not shown prior invention of the generic subject matter that Zletz

asserts is defined in claims 13 and 14. For this finding, the examiner relied on rulings of the district court in the polypropylene interference concerning Zletz's early work. The examiner also invoked interference estoppel against claim 13, stating that due to estoppel the practice set forth in *In re Frilette*, 58 C.C.P.A. 799, 436 F.2d 496, 168 U.S.P.Q. (BNA) 368 (1971), discussed *infra*, was not available to Zletz.

The Board affirmed the examiner's rejection of the claims, on somewhat different reasoning. The Board held that Zletz was estopped from relying on his 1951 and 1952 patent applications and early experimental work to antedate the effective dates of the cited references and the date of invention awarded to the lost count, based on the Board's interpretation of claims 13 and 14 as of identical scope to the lost count. The Board held that claims 13 and 14 are "interpreted as being directed to normally [*5] solid linear high homopolymers of propylene which have a crystalline polypropylene content", despite the broader words of the claims. On this claim interpretation, the Board held that claims 13 and 14 define the same subject matter as the lost count of the interference, and not a different, generic invention, and thus that Zletz is collaterally estopped from obtaining these claims by simply antedating the references and the lost count by the mechanism provided in Rule 131. This appeal followed.

Claim Interpretation

The Board erred in its interpretation of claims 13 and 14, the error apparently flowing from the Board's choice of an inapplicable legal premise. The Board applied the mode of claim interpretation that is used by courts in litigation, when interpreting the claims of issued patents in connection with determinations of infringement or validity. See, e.g., *Tandon Corp. v. United States Int'l Trade Comm'n*, 831 F.2d 1017, 1021, 4 USPQ2d 1283, 1286 (Fed.Cir. 1987) (meaning of claims of issued patent interpreted in light of specification, prosecution history, prior art, and other claims). This is not the mode of claim interpretation that is applicable [*6] during prosecution of a pending application before the PTO.

During patent examination the pending claims must be interpreted as broadly as their terms reasonably allow. When the applicant states the meaning that the claim terms are intended to have, the claims are examined with that meaning, in order to achieve a complete exploration of the applicant's invention and its relation to the prior art. See *In re Prater*, 56 C.C.P.A. 1381, 415 F.2d 1393,

1404-05, 162 U.S.P.Q. (BNA) 541, 550-51 (1969) (before the application is granted, there is no reason to read into the claim the limitations of the specification). The reason is simply that during patent prosecution when claims can be amended, ambiguities should be recognized, scope and breadth of language explored, and clarification imposed. *Burlington Industries, Inc. v. Quigg*, 822 F.2d 1581, 1583, 3 U.S.P.Q.2D (BNA) 1436, 1438 (Fed.Cir. 1987); *In re Yamamoto*, 740 F.2d 1569, 1571, 222 U.S.P.Q. (BNA) 934, 936 (Fed.Cir. 1984). The issued claims [*322] are the measure of the protected right. [*7] *United Carbon Co. v. Binney & Smith Co.*, 317 U.S. 228, 232, 55 U.S.P.Q. (BNA) 381, 383-84, 87 L. Ed. 232, 63 S. Ct. 165 (1942) (citing *General Electric Co. v. Wabash Appliance Corp.*, 304 U.S. 364, 369, 37 U.S.P.Q. (BNA) 466, 468-69, 82 L. Ed. 1402, 58 S. Ct. 899 (1938)). An essential purpose of patent examination is to fashion claims that are precise, clear, correct, and unambiguous. Only in this way can uncertainties of claim scope be removed, as much as possible, during the administrative process.

Thus the inquiry during examination is patentability of the invention as "the applicant regards" it;³ and if the claims do not "particularly point[] out and distinctly claim[]", in the words of section 112, that which examination shows the applicant is entitled to claim as his invention, the appropriate PTO action is to reject the claims for that reason. *Burlington Industries*, 822 F.2d at 1583-84, 3 USPQ2d at 1438; *In re Cormany*, 476 F.2d 998, 999-1001, 177 U.S.P.Q. (BNA) 450, 451-52 (CCPA 1973); *Prater*, 415 F.2d at 1404, 162 USPQ at 550 [*8] (claim that reads on subject matter beyond the applicant's invention fails to comply with 35 U.S.C. § 112).

3 35 U.S.C. § 112 para. 2:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

It was incorrect for the Board to read unwritten limitations into claims 13 and 14, limitations contrary to the plain words of the claims, and contrary to the interpretation that the inventor himself placed on the claims. Claim 13, according to Zletz, does not require that the polymer consist essentially of recurring propylene units or that the crystalline content be substantial; and claim 14 requires neither crystalline content nor, according to Zletz, that the polypropylene be

a homopolymer. The Board erred in holding that claims 13 and 14 must be read to include [*9] all the limitations of the lost count.

Patentability

A losing party to an interference is entitled to claim subject matter other than that of the interference count, provided the requirements of patentability are met, and subject to those constraints that flow from the adverse decision in the interference. *Frilette*, 436 F.2d at 499-500, 168 USPQ at 370-71; *In re Risse*, 54 C.C.P.A. 1495, 378 F.2d 948, 955-56, 154 U.S.P.Q. (BNA) 1, 7 (1967), overruled in part on other grounds by *In re Smith*, 59 C.C.P.A. 1025, 458 F.2d 1389, 1395, 173 U.S.P.Q. (BNA) 679, 683 (1972).

Zletz argues that the applicable law requires the grant of claims 13 and 14 because these claims define a different, generic invention as compared with the lost count. Zletz states that his early work shows conception and reduction to practice of the subject matter of claims 13 and 14, relying in part on the allowance of similar claims before the interference was declared. He argues that the court's ruling in the interference that he had not shown reduction to practice [*10] of the lost count based on his early work, including the court's ruling that his products lacked utility, does not serve as an estoppel because the requirements for proof of conception and reduction to practice are different in *ex parte* prosecution from that required to prove priority in an interference proceeding.

Rule 131⁴ provides an *ex parte* mechanism whereby a patent applicant may antedate subject matter in a reference, even if the reference describes the same [*323] invention that is claimed by the applicant, provided that the same invention is not claimed in the reference when the reference is a United States patent. As explained in *In re McKellin*, 529 F.2d 1324, 1329, 188 U.S.P.Q. (BNA) 428, 434 (CCPA 1976), the disclosure in a reference United States patent does not fall under 35 U.S.C. § 102(g) but under 35 U.S.C. § 102(e), and thus can be antedated in accordance with Rule 131. But when the subject matter sought [*11] to be antedated is claimed in the reference patent, Rule 131 is not available and an interference must be had to determine priority. *In re Fickmeyer*, 602 F.2d 974, 979, 202 U.S.P.Q. (BNA) 655, 660 (CCPA 1979); *In re Clark*, 59 C.C.P.A. 924, 457 F.2d 1004, 1007, 173 U.S.P.Q. (BNA) 359, 361 (1972).

4 37 C.F.R. 1.131. Affidavit or declaration of prior invention to overcome cited patent or publication.

(a) When any claim . . . is rejected on reference to a domestic patent which substantially shows or describes but does not claim the rejected invention . . . the inventor . . . shall make oath or declaration as to facts showing a completion of the invention in this country before the filing date of the application on which the domestic patent issued. . . .

(B) The showing of facts shall be such . . . as to establish reduction to practice . . . or conception . . . coupled with due diligence from [the effective date of the reference] to a subsequent reduction to practice or to the filing of the application. Original exhibits of drawings or records, or photocopies thereof, must accompany and form part of the affidavit or declaration or their absence satisfactorily explained.

[**12] Thus a losing party to an interference, on showing that the invention now claimed is not "substantially the same" as that of the lost count, *Frilette*, 436 F.2d at 500, 168 USPQ at 371, may employ the procedures of Rule 131 in order to antedate the filing date of the interfering application. The lost count of the interference is not prior art against a different invention, for "prior art" in the sense of section 102(g) cannot be the basis of a section 102(a) rejection, the invention not being publicly "known or used". *In re Taub*, 52 C.C.P.A. 1675, 348 F.2d 556, 562, 146 U.S.P.Q. (BNA) 384, 389 (1965) (emphasis in original). See generally *Wetmore v. Quick*, 536 F.2d 937, 943, 190 U.S.P.Q. (BNA) 223, 228 (CCPA 1976) ("The law developed in our Rule 131 cases has little bearing on the law relating to interference practice.")

Zletz asks us to view the subject matter of the lost count as simply a species of polypropylene, and argues that the later discovery of a species does not bar the grant of generic claims to the earlier discoverer [**13] of a genus encompassing that species. Priority as to a genus may indeed be shown by prior invention of a single species, *Taub*, 348 F.2d at 562, 146 USPQ at 389, but the genus will not be patentable to an applicant unless he has generic support therefor. *In re Grimme*, 47 C.C.P.A. 785, 274 F.2d 949, 952, 124 U.S.P.Q. (BNA) 499, 501 (1960); *In re Kyrides*, 34 C.C.P.A. 920, 159 F.2d 1019, 1021-22,

73 U.S.P.Q. (BNA) 61, 63 (CCPA 1947). See *In re Stempel*, 44 C.C.P.A. 820, 241 F.2d 755, 759-60, 113 U.S.P.Q. (BNA) 77, 81 (1957) (discussing what is necessary to successfully "swear back" of a reference under Rule 131, when the reference discloses a species of the applicant's generic claim).

While there is not crystal clarity between the requirement in *Taub* that the applicant's earlier invention be patentably distinct from the lost count, and the holding in *Frilette* wherein it was sufficient for the applicant merely to antedate the lost count as to "different" subject matter that he was prevented from including in the [**14] interference, the issue raised in *Zletz's* case does not require resolution of this question as to all factual circumstances. There is a sufficiently consistent thread in this precedent insofar as it relates to the issue presented by *Zletz*: that is, the issue of species and generic claims.

In *Zletz's* case, he is not attempting to claim a different species from that described in the references and the lost count. He is seeking generic claims that he defines as including the subject matter of the lost count. To prevail, *Zletz* must show that he made the generic invention he is claiming. Even if *Zletz's* Rule 131 affidavits were sufficient to "swear back" of the references with respect to his early work, that does not go to the question of the sufficiency of *Zletz's* early work to show that he made a generic invention of the scope he attributes to claims 13 and 14.

Zletz argues that these claims are supported by his 1951 and 1952 disclosures, his experiments EP-34, 35, and 37A, and rulings made during the interference. The district court, in the polypropylene interference, held that *Zletz* had not actually reduced to practice the subject matter of the lost count based on the early work [**15] now relied on. *Standard Oil*, 494 F. Supp. at 399, 407, 206 USPQ at 705, 711.

The court held that *Zletz's* experiments EP-34 and 35 produced solid copolymers that included polypropylene components of varying degrees of crystallinity, separated by methylene sequences, and that these products did not meet the limitation of the [**324] count "consisting essentially of recurring propylene units". *Id.* at 400-02, 206 USPQ at 706-08. *Zletz* now relies on this ruling to support the position that he made an invention distinct from and generic ⁵ to that defined in the lost count.

5 The Commissioner correctly points out that

claims 13 and 14 as they are written do not clearly define the generic invention that Zletz states he intends these claims to cover. During the interference the examiner ruled that "polypropylene" means a homopolymer, that is, consisting essentially of recurring propylene units; and included this definition in the interference count. Zletz's asserted meaning of "polypropylene" to include homopolymers and copolymers containing significant methylene sequences is contrary to the interference definition. Although Zletz refers to the district court's usage as supporting his own, we do not discern such looseness of usage in the district court's opinion as could extend "polypropylene" to encompass Zletz's copolymers.

[**16] Experiment EP-37A was held inadequate in the interference proceeding because of insufficient evidence that the product met the limitation "consisting essentially of recurring propylene units". Zletz has now presented to the PTO, during this *ex parte* prosecution, newly discovered evidence of the crystalline content and composition of the EP-37A product. Zletz states that the product of EP-37A, as reproduced 36 years after the original experiment, contains at most 3% ethylene, and has a 68% or 72% crystalline component. The examiner

observed that the original EP-37A was reported in Zletz's 1951 patent application to have a methylene to methyl ratio of 4, not significantly different from those of Runs EP-34 and 35, which the district court found to be copolymers. A polypropylene homopolymer would have a methylene to methyl ratio of about 1. Zletz's response is that the early method for measuring methylene to methyl ratios was inaccurate. However, these procedures, and their significance, were fully debated during the interference, under examination and cross-examination, and are not before us for *de novo* evaluation. To the extent that Zletz now asks that the examiner consider [**17] Zletz's new data, we conclude that the Board did not err in its holding that Zletz is collaterally estopped from relitigating issues determined in the interference.

We agree with the Solicitor that the evidence of EP-34 and 35 may support the patentability of an invention different from that of the lost count; but they do not support the patentability of claims 13 and 14 when these claims are given the scope that Zletz states he intends them to have. Zletz has not shown that he made an invention generic to both the copolymers of his early experiments and the subject matter of the lost count. On this basis, the Board's decision is

AFFIRMED.

11 of 230 DOCUMENTS

LACKS INDUSTRIES, INC., Plaintiff-Appellant, v. MCKECHNIE VEHICLE COMPONENTS USA, INC. (doing business as Thompson International), Defendant-Cross Appellant, and HAYES WHEEL INTERNATIONAL, INC. (now known as Hayes Lemmerz International, Inc.), Defendant-Cross Appellant.

01-1371, 01-1395, 01-1396

UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

322 F.3d 1335; 2003 U.S. App. LEXIS 4471; 66 U.S.P.Q.2D (BNA) 1083; 49 U.C.C. Rep. Serv. 2d (Callaghan) 1095

March 13, 2003, Decided

SUBSEQUENT HISTORY: Later proceeding at *Lacks Indus. v. McKechnie Vehicle Components USA, Inc.*, 2005 U.S. Dist. LEXIS 42575 (E.D. Mich., July 29, 2005)

PRIOR HISTORY: [*1] Appealed from: United States District Court for the Eastern District of Michigan. Senior Judge John Feikens. *Lacks Indus., Inc. v. McKechnie Vehicle Components USA, Inc.*, 55 F. Supp. 2d 702, 1999 U.S. Dist. LEXIS 10355 (E.D. Mich., 1999)

DISPOSITION: Affirmed-in-part, vacated-in-part, and remanded.

COUNSEL: David W. Wicklund, Shumaker, Loop & Kendrick, LLP, of Toledo, Ohio, argued for plaintiff-appellant. With him on the brief was Jeffrey S. Creamer. Of counsel on the brief was Remy J. VanOphem, VanOphem & VanOphem, P.C., of Troy, Michigan.

J. Michael Hugot, Butzel Long, of Ann Arbor, Michigan, argued for defendant-cross appellant McKechnie Vehicle Components USA, Inc. (doing business as Thompson International). With him on the brief was John C. Blattner.

Stephen E. Glazek, Barris, Sott, Denn & Driker, PLLC, of Detroit, Michigan, for defendant-cross appellant Hayes Wheel International, Inc. (now known as Hayes Lemmerz International, Inc.) Of counsel on the brief was William J. Clemens, MacMillan, Sobanski & Todd, LCC, of Livonia, Michigan. Of counsel was Kathryn A. Viviano, Barris, Sott, Denn & Driker, PLLC, of Detroit, Michigan.

JUDGES: Before NEWMAN, MICHEL, and CLEVENGER, Circuit Judges. Opinion for the court filed

by Circuit Judge MICHEL. Opinion concurring in part and dissenting in part filed by Circuit Judge NEWMAN. [**2] Opinion dissenting in part filed by Circuit Judge CLEVENGER.

OPINION BY: MICHEL

OPINION

[*1338] MICHEL, *Circuit Judge.*

Plaintiff-appellant Lacks Industries, Inc. ("Lacks") appeals the rulings of the United States District Court for the Eastern District of Michigan: (1) granting summary judgment of noninfringement of method claims 1 and 2 of *U.S. Patent No. 5,577,809* ("the '809 patent") and product claims 1, 2, 4-6, 8, 9, 11, 12, and 14-16 of *U.S. Patent No. 5,636,906* ("the '906 patent"); (2) granting summary judgment of invalidity for obviousness of all the asserted claims of the '809 and '906 patents; (3) granting summary judgment of invalidity under § 102 of method claims 1, 3, and 8 of *U.S. Patent No. 5,597,213* ("the '213 patent"); and (4) adopting a Special Master's findings after trial of invalidity of method claims 11-13, 20-22, and 24-25 of the '213 patent as a result of Lacks' commercial activities. Defendants-cross appellants Hayes Wheel International, Inc. ("Hayes") and McKechnie Vehicle Components USA, Inc. ("McKechnie") cross-appeal the court's decisions adopting the Special Master's findings after trial: (1) that claims 11-13, 20-22, and 24-25 of the '213 patent were not proven [**3] invalid under § 102(b) as a result of any offer to sell or public use by Hayes or McKechnie and (2) that defendants' product infringed claims 11-13, 20, and 24-25 of the '213 patent.

We affirm: (1) the grants of summary judgment of noninfringement of the '809 and '906 patents; (2) the grant of summary judgment of invalidity under § 102 of claims

1, 3, and 8 of the '213 patent; (3) the finding of infringement of claims 11-13, 20, and 24-25 of the '213 patent; and (4) the finding that claims 11-13, 20-22, and 24-25 of the '213 patent were not proven invalid as a result of the pre-critical date public use or sale by Hayes or McKechnie. Because the Special Master applied an incorrect legal standard, we vacate and remand his finding that claims 11-13, 20-22, and 24-25 of the '213 patent were invalid because of Lacks' pre-critical date sales promotion activities. Because we need not reach a mere affirmative defense, and decline to do so, we vacate the district court's grant of summary judgment of invalidity for obviousness of the asserted claims of the '809 and '906 patents.

I.

The parties are all involved in the manufacture and sales of cladded wheels: automotive wheels that have [**4] a decorative cover¹ attached to their outer face (the side facing out from the automobile). The development of these wheels has been driven by cost and aesthetic considerations. Apparently, automobile buyers increasingly desire wheels with a shiny chrome look. Automobile manufacturers and suppliers want to meet this growing consumer demand without having to plate the entire wheel in chrome, an expensive process. As a result, inventors have developed chrome-plated cladding that covers only the visible portion of the wheel. This cladding is attached as a snug, plastic or metal skin over the outer wheel face, thus giving the wheel a chrome-like appearance at less cost than chrome plating of the entire wheel.

1 The terms "decorative cover," "cladding," and "overlay" all mean the same thing.

Lacks owns by assignment (from named inventor Lee Chase) the '809, '906, and '213 patents, all covering various aspects of cladded wheels. Chase filed his original patent application, No. 904,180, on June [**1339] 25, 1992. Thereafter [**5] he filed divisional applications on June 7, 1995 and March 29, 1995 which led to the '809 patent and the '906 patent, respectively. Both patents share a common specification, though the '809 patent is drawn to a method for making cladded wheels and the '906 patent is drawn to the cladding as an apparatus. The '213 patent sprang from the same work as the '809 and '906 patents, but matured from its own June 6, 1995 application and has a disclosure different from that of the '809 and '906 patents. The '213 patent discloses a method and apparatus for the assembly of a cladded wheel through the use of a temporary securing and positioning means and the selective application of an adhesive. Lacks currently manufactures, assembles, and sells a cladded wheel product based on these patents.

Lacks sued Hayes and McKechnie for infringement of the '809, '906, and '213 patents by their manufacture and sale of cladded wheels based on McKechnie's U.S. Patent No. 5,368,370 ("the '370 patent"). After Lacks filed suit, many of the asserted claims in the '809 and '906 patents were withdrawn by stipulation. Infringement of the remaining claims of those two patents and the asserted claims of the '213 patent [**6] was first addressed by the district court when confronted with multiple motions for partial summary judgment. Lacks moved for summary judgment of infringement of '809 patent claim 1; '906 patent claims 1, 11, and 16; and '213 patent claims 25 and 40. Defendants cross-moved for summary judgment of noninfringement of '809 patent claims 1 and 2; '906 patent claims 1-2, 4-6, 8-9, 11-12, and 14-16; and '213 patent claims 1, 3, 7-9, 32, 35, and 37-40.

In addressing the '809 and '906 patents, the district court first construed the disputed limitations. Claim 1 of the '809 patent is representative of the asserted claims of both the '809 and '906 patents² (disputed claim language underlined):

1. A method for providing a decorative surface on a vehicle wheel having a web portion and a peripheral rim portion for mounting a vehicle tire, said peripheral rim portion defining an *axial peripheral lip* circumscribing said peripheral rim portion and structural means interconnecting said web portion and said peripheral rim portion, said web portion and said peripheral rim portion defining a *wheel face outer surface*, said method comprising the steps of:

forming a thin solid [**7] ornamental panel of uniform thickness having an interior and exterior surface, said thin solid formed ornamental panel being shaped to cover said entire wheel face outer surface and not cover said *axial peripheral lip* so as to mate to said wheel and substantially conform said exterior surface of said thin solid formed ornamental panel to adjacent contours of said wheel face outer surface of said wheel;

applying a decorative layer on said exterior surface of

said thin solid formed ornamental panel:

applying an adhesive to one of said wheel face outer surface of said wheel and said interior surface of said thin solid formed ornamental panel; and

*positioning said interior surface of said thin solid formed ornamental panel against said adhesive so as to adhere said thin solid formed ornamental [*1340] panel to said wheel face outer surface;*

*whereby said positioning step locates said thin solid formed ornamental panel so as to be substantially flush with adjacent portions of said wheel face outer surface of said wheel such that said decorative layer readily blends with said axial peripheral lip circumscribing said peripheral rim portion so as to provide [***8] a visual impression that said decorative layer is substantially flush with said adjacent portions of said wheel face outer surface and thereby appears to constitute an integral portion of said wheel.*

'809 patent, cols. 10-12. First, the court construed the claim term "axial peripheral lip" in both the '809 and '906 patents to mean "that uncovered surface of the composite wheel that starts at the edge of the cladding, goes up and over the top of the projecting rim lip, and ends where the outer side of the rim lip merges with the tire mounting surface of the wheel rim." *Lacks Indus., Inc. v. McKechnie Vehicle Components U.S.L. Inc.*, 55 F. Supp. 2d 702, 711 (E.D. Mich. 1999). Second, the court construed "wheel face outer surface" in both the '809 and '906 patents to mean "the entire area of the wheel's exposed face that lies

within the circumscribing boundary of the inner shoulder of the axial peripheral lip." *Id.* at 712. Third, in light of the undisputed structure of the accused product³ and because the district court construed the claim terms such that the cladding must cover all of the outer face and none of the axial peripheral lip. [***9] the court granted summary judgment of noninfringement of the asserted claims of the '809 and '906 patents. *Id.* at 722-23.

2 The parties have referred to the '809 and '906 patents together in their claim construction and literal infringement arguments, so we do not differentiate between them here either. The substance and language of both patents are similar and the patents share the same specification.

3 It is undisputed that the accused product contains cladding that covers all the outer face and most (if not all) of what corresponds to the axial peripheral lip disclosed in the patent.

The court also addressed several other issues. The court granted summary judgment of invalidity under § 102 of claims 1, 3, and 8 of the '213 patent because of the publication of Lacks' foreign patent applications corresponding to the '809 and '906 patents. *Id.* at 736-37. The court also granted summary judgment of invalidity for obviousness of the asserted claims of the '809 and '906 patents. [***10] *Id.* at 731. The court found that the combination of three prior art references, all drawn to decorative wheel coverings, provided a prima facie case of obviousness and that Lacks' evidence of secondary considerations failed to rebut that prima facie case. In addition, the court construed all relevant limitations in the asserted claims -- both in addressing the motions for partial summary judgment and in a separate *Markman* order -- and denied several other motions for partial summary judgment.

By agreement of the parties, the remaining issues on infringement and validity were referred to a Special Master for trial. In an extensive (82-page) written opinion, the Special Master found claims 11-13, 20, and 24-25 of the '213 patent infringed and claims 11-13, 20-22, and 24-25 of the '213 patent invalid. As to infringement, the dispute centered on the limitation that an adhesive "permanently secure" the cladding to the wheel. The following excerpt from claim 11 of the '213 patent is representative of the relevant limitation: "Assembling said overlay to said outboard surface of said wheel with said curable adhesive so as to form said gap and permanently secure said [***11] overlay to said wheel, at least one void being present between said overlay and said outboard surface of said wheel." '213 patent, col. 15, lines 29-33 (emphasis added). The district court in its *Markman* order, construed the "permanently secure" limitation [***1341] to mean

"that the curable adhesive is *itself* capable of securing the overlay to the wheel during the normal useful life of the wheel." After trial, the Special Master found this limitation met and therefore found that Hayes and McKechnie literally infringed claims 11-13, 20, 24 and 25 of the '213 patent.

The Special Master next considered the validity of the '213 patent. First, the Special Master found that claims 11-13, 20-22, and 24-25 of the '213 patent were not invalid as a result of any prior offer for sale or public use by the defendants. The issue here was whether the cladded wheel product used publicly and offered for sale by defendants used only partial adhesive coverage to attach the cladding to the wheel and therefore embodied the claimed method. The Special Master found the defendants had not clearly and convincingly proven this fact because the recollection testimony of three Hayes employees to that effect [**12] was insufficiently corroborated by documentary evidence. Second, the Special Master found that Lacks' *own* pre-critical date sales promotion activities were sufficiently commercial to raise the on-sale bar, thus invalidating these claims. The issue here was whether Lacks' activities constituted an offer for sale. The Special Master found that they did, relying on our decision in *RCI Corp. v. Dots General Corp.*, 887 F.2d 1056, 12 USPQ2d 1449 (Fed. Cir. 1989). The district court adopted the Special Master's findings in their entirety and entered judgment accordingly.

All rulings discussed heretofore have been timely appealed. We have jurisdiction pursuant to 28 U.S.C. § 1295(a)(1).

II.

We are presented here with a grant of summary judgment of noninfringement and a trial court's findings of infringement based on a Special Master's recommendations. We review *de novo* the grant of summary judgment. *Ethicon Endo-Surgery, Inc. v. United States Surgical Corp.*, 149 F.3d 1309, 1315, 47 USPQ2d 1272, 1275 (Fed. Cir. 1998). Summary judgment is appropriate if, drawing all factual inferences in favor of the non-movant, there is no [**13] genuine issue of material fact and the movant is entitled to judgment as a matter of law. *Fed. R. Civ. P. 56(c)*; *Anderson v. Liberty Lobby, Inc.*, 477 U.S. 242, 255, 91 L. Ed. 2d 202, 106 S. Ct. 2503 (1986). "The findings of a special master, to the extent that the court adopts them, shall be considered as the findings of the court" and we review them for clear error. *Fed. R. Civ. P. 52(a)*.

Patent infringement analysis involves two steps. *Johnson Worldwide Assocs., Inc. v. Zebeo Corp.*, 175 F.3d 985, 988, 50 USPQ2d 1607, 1609 (Fed. Cir. 1999). First, the court determines the scope and meaning of the

asserted claims. *Markman v. Westview Instruments, Inc.*, 517 U.S. 370, 372-74, 134 L. Ed. 2d 577, 116 S. Ct. 1384 (1996). This claim construction is an issue of law and is reviewed without deference to the district court. *Cybor Corp. v. FAS Techs., Inc.*, 138 F.3d 1448, 1456, 46 USPQ2d 1169, 1174 (Fed. Cir. 1998) (*en banc*). Second, the claims as construed by the court are compared to the allegedly infringing device. *Johnson*, 175 F.3d at 988, 50 USPQ2d at 1609. The determination as to whether the claims, [**14] as properly construed, read on the accused device presents an issue of fact that we review for clear error. *Elkay Mfg. Co. v. Ebco Mfg. Co.*, 192 F.3d 973, 976, 52 USPQ2d 1109, 1111 (Fed. Cir. 1999).

In engaging in the first step, claim construction, we begin with an examination of the intrinsic evidence, *i.e.*, the claims, the other portions of the specification, and the prosecution history (if in evidence). *Gart v. Logitech, Inc.*, 254 F.3d 1334, 1339, 59 USPQ2d 1290, 1293-94 (Fed. Cir. 2001). [**1342] Courts may also review extrinsic evidence in construing a claim. *E.g.*, *Spectrum Int'l, Inc. v. Sterlite Corp.*, 164 F.3d 1372, 1378, 49 USPQ2d 1065, 1068 (Fed. Cir. 1998). Additionally, dictionary definitions, although extrinsic, may be used to establish a claim term's ordinary meaning. *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1584 n.6, 39 USPQ2d 1573, 1580 n.6 (Fed. Cir. 1996).

A. Lacks' Appeal of Summary Judgment of Noninfringement of the Asserted Claims of the '809 and '906 Patents.

On appeal Lacks argues that the district court erred in its construction of the limitations "axial peripheral lip" [**15] and "wheel face outer surface" in the '809 and '906 patents. Focusing first on "axial peripheral lip," the district court construed the term to mean "that uncovered surface of the composite wheel that starts at the edge of the cladding, goes up and over the top of the projecting rim lip, and ends where the outer side of the rim lip merges with the tire mounting surface of the wheel rim." *Lacks*, 55 F. Supp. 2d at 711. According to Lacks, however, "axial peripheral lip" refers only to the projecting lip at the outermost edge of the wheel rim, as this is the plain meaning of the language. For support Lacks recites the dictionary definitions of "axial" ("around an axis"), "peripheral" ("of, relating to or forming a periphery," which is defined as "the perimeter of a circle"), and "lip" ("the edge or margin of a hollow vessel or cavity," or "an edge" or "margin"). *Webster's Third International Dictionary* (1997). These definitions, Lacks argues, render plain the meaning of "axial peripheral lip" as "the edge at the outermost perimeter circumscribing the rim."

Lacks next points to the prosecution history, noting that the limitation was added through amendment after [**16] the examiner rejected the claims as obvious in

light of *U.S. Patent No. 3,726,566* ("the Beith patent"). The Beith patent taught a decorative wheel cover extending over the outermost edge of the wheel rim. To avoid Beith, Lacks added the "axial peripheral lip" limitation and also added the language about the panel blending with the lip to provide a visual impression that the decorative layer "appears to constitute an integral portion of said wheel." Lacks argues that one of ordinary skill in the art would realize that its amendment surrendered only enough subject matter to get around Beith. Therefore, Lacks contends, the "axial peripheral lip" limitation only prevents the decorative cover from extending over the outermost edge of the wheel rim.

Lacks' arguments fail to persuade us that its construction is correct. First, the dictionary definitions do not provide a plain meaning. As McKechnie points out, these definitions also fit the district court's construction. Second, Lacks' amendment to overcome the Beith patent, although providing some support for Lacks' construction, does not outweigh the support for the district court's construction present in the claim language and the specification. [*17] The district court observed that the limitation appears at three points in claim 1 of the '809 patent and concluded, from this context, that the axial peripheral lip "is not covered by the panel" and "touches the edge of the decorative layer in such a way that aesthetic blending occurs." *Lacks*, 55 F. Supp. 2d at 710. The final point is key, because under Lacks' construction this "aesthetic blending" would have to occur between two things that are not adjacent: the outermost edge of the wheel rim and the edge of the cladding. While this is not impossible, it is unlikely and the district court's construction avoids such a problem.

The drawings also support the district court's construction. Figures 3 and 5 disclose the preferred embodiment of the '809 [*1343] patent and explicitly identify a "peripheral rim portion or rim 12" and an "axial peripheral lip 12a."

[SEE FIGURE 5 AND FIGURE 3 IN ORIGINAL]

Here, the diagrams indicate two separate edges on the wheel rim, an interior one facing the center of the wheel, and an external one facing the outside. Notably, the pointer in figure 3 points to the outermost edge (supporting Lacks' construction), while the pointer in figure [*18] 5 points to the middle of the flat between the inside and outside edges. We do not think it reasonable to view one diagram as correct, but the other as erroneous. The better interpretation is that these references both refer to the larger structure the district court construed as being the "axial peripheral lip."

In sum, the weight of the intrinsic evidence supports the district court's construction and we therefore uphold the district court's construction of "axial peripheral lip."

Lacks also challenges the court's construction of "wheel face outer surface" in the '809 and '906 patents. The district court construed the term to mean "the entire area of the wheel's exposed outer face that lies within the circumscribing boundary of the inner shoulder of the axial peripheral lip." *Id.* at 712. On appeal, Lacks argues that the dimensions of the cladding define the "wheel face outer surface," so long as the cladding covers some of the web and rim portions. * Again we are not persuaded.

4 The web portion of the wheel is the central portion of the wheel composed of "spokes, spiders, or webs." '809 patent, col. 6, lines 64-66. The rim portion is that portion of the wheel that circumscribes the web portion.

[**19] Lacks' proposed construction is simply not consistent with the language of the [*1344] claims. As the district court noted, the limitation first appears in the preamble of claim 1 of the '809 patent: "A method for providing a decorative surface on a composite vehicle wheel having a web portion and a peripheral rim portion for mounting a vehicle tire . . . said web portion and said peripheral rim portion defining a wheel face outer surface." '809 patent, col. 10, lines 65-67, col. 11, lines 3-5 (emphasis added). The limitation also appears later in the claim: "said thin solid formed ornamental panel being shaped to cover said entire wheel face outer surface and not cover said axial peripheral lip." *Id.* col. 11, lines 8-11. From this language the district court reasoned that "wheel face outer surface" must be the "area of the wheel's exposed outer face that lies within the circumscribing boundary of the inner shoulder of the axial peripheral lip." *Lacks*, 55 F. Supp. 2d at 712.

Given this clear language, Lacks' arguments to the contrary are not persuasive. The district court's construction is the only reading consistent with the plain language of the claim limitation [*20] and we therefore uphold the district court's construction of "wheel face outer surface."

This brings us to the second step in the infringement analysis, the comparison of the claims as construed to the allegedly infringing product. Because we uphold the court's claim construction, we also affirm the court's grant of summary judgment because noninfringement follows inexorably in this case from the claim construction. *Id.* at 722. This is because it is undisputed that the accused product covers at least part of the axial peripheral lip as construed and therefore cannot satisfy the "not cover said axial peripheral lip" limitation in the asserted claims. *Id.* at 722-23.

B. Hayes' and McKechnie's Cross-Appeal of the Finding of Infringement of the '213 Patent.

The district court adopted the Special Master's post-trial finding that Hayes and McKechnie literally infringed claims 11-13, 20, 24, and 25. The sole infringement issue on the cross-appeal, as below, is whether the defendants' product satisfied the limitation that the adhesive "permanently secure" the cladding to the wheel. The district court construed "permanently secure" to mean that the "adhesive [*21] is *itself* capable of securing the overlay to the wheel during the normal useful life of the wheel." (emphasis in original). After hearing testimony about various industry standards and tests, the Special Master found this limitation met.

In their cross-appeal, Hayes and McKechnie argue the Special Master erred in finding infringement. They first contend that in adopting his standard, he impermissibly re-constructed the limitation, reading out the requirement that the adhesive secure the cladding by "itself." The Special Master found that the limitation would be met if the adhesive: "(1) satisfies the specifications set forth on the Hayes engineering drawing for the accused F-150 wheel and (2) retains sufficient retentive strength (without reliance on the mechanical locking system) to secure the overlay throughout Ford's vehicle durability testing, but with a modified upper temperature limit." Defendants-cross appellants argue the Special Master erred because both the specification and test he adopts as his standard accounted for the presence of their mechanical lock.

Their second set of arguments challenge the evidentiary support of the Special Master's findings regarding what [*22] test conditions and results warrant an inference that the "permanently secure" limitation is met. They assert that Lacks' evidence is [*1345] insufficient to support a finding of infringement because (1) Lacks only did certain laboratory tests of the accused device, without testing the adhesive under road conditions, and (2) they never tested the device without the mechanical lock so that the adhesive was the only thing holding it together. If the Special Master had properly addressed the above deficiencies, defendants-cross appellants maintain, it would have been clear that the adhesive in the accused product cannot hold up for the life of the wheel under the intense heat and stress conditions of normal use.

Upon review, we cannot say that the Special Master's findings were clearly erroneous. First, we reject the argument that he reconstructed the "permanently secured" limitation, reading out the requirement that the adhesive *itself* secure the cladding. A far more accurate reading of the Special Master's analysis is that he simply evaluated evidence of the conditions a wheel would encounter during its normal useful life and created a benchmark for measuring whether those conditions were [*23] met by "constructing a mosaic of numerous laboratory and vehicle tests and related trial testimony." Such an amalga-

mation of different tests and specifications was necessary because "no separate specifications existed for securing overlays . . . to wheels." He chose the particular specification and test in creating his standard because he found that they represented the conditions cladded wheels would encounter in their normal use, not because they were designed to test whether an adhesive could itself secure a cladding to a wheel over its useful life. At all times he explicitly recited his task as determining whether the adhesive "itself" was capable of "permanently securing" the cladding for the life of the wheel. We accept that he did so.

Second, there was evidence to support the infringement findings that these conditions were satisfied by the accused product. There was evidence of the specifics of each individual test in the form of expert and other testimony and documents. First, the shear (coupon) tests on two small, flat panels joined by the adhesive at issue showed "acceptable adhesion was obtained throughout all test conditions." Second was Lacks' rotary and radial fatigue [*24] and impact testing of new, unused Hayes wheels with the mechanical lock disabled, after which the testers were "unable to remove the cladding by prying with a small tool." Third, and most persuasive were McKechnie's 1998 tests of wheels that "had been subjected to a durability cycle that included several adverse environmental conditions." In the subsequent pull off testing, nearly 800 pounds of force was required to remove the cladding from the wheel utilizing only the mechanical lock, whereas 1500 pounds of force was required to remove the cladding from the wheel using only the adhesive. The Special Master found this to be especially relevant, given McKechnie's assertions that the mechanical lock itself was the sole cause of permanent retention of their cladding to the wheels.

In sum, because we reject Hayes' and McKechnie's argument that the Special Master reconstructed the "permanently secured" limitation and because there was evidence to support the Special Master's finding of infringement of the '213 patent, we affirm the court's rulings as not clearly erroneous.

III.

The district court granted summary judgment of both invalidity for obviousness of the asserted claims of the [*25] '809 and '906 patents and invalidity for anticipation of claims 1, 3, and 8 of the '213 patent. After a bench trial, a Special Master found claims 11-13, 20-22, and 24-25 invalid under [*1346] the on-sale bar as a result of Lacks' pre-critical date sales promotion activities and found that no bar resulted from the pre-critical date activities of Hayes and McKechnie.

As a threshold matter, we note that we do not reach the validity issues pertaining to the '809 or '906 patents because we have affirmed the trial court's grant of summary judgment of non-infringement and because invalidity was raised before merely as an affirmative defense to infringement. See *Cardinal Chem. Co. v. Morton Int'l, Inc.*, 508 U.S. 83, 93, 102, 1241, *Ed. 2d* 1, 113 S.Ct. 1967 (1993) (holding that a court's affirmation of a finding of non-infringement is not per se a sufficient reason for vacating a declaratory judgment holding the patent invalid, but noting "an unnecessary ruling on an affirmative defense is not the same as the necessary resolution of a counterclaim for a declaratory judgment"); *Hill-Rom Co., Inc. v. Kinetic Concepts, Inc.*, 209 F.3d 1337, 1344, 54 USPQ2d 1437, 1442 (*Fed. Cir.* 2000) [**26] (holding that it need not reach or vacate the district court's finding that a patent was not invalid where it had affirmed the trial court's judgment of non-infringement). We address the remaining issues in turn.

A. Lacks' Appeal of Summary Judgment of Invalidity of Claims 1, 3, and 8 of the '213 Patent under Section 102.

The district court granted summary judgment of invalidity of claims 1, 3, and 8 of the '213 patent under § 102 because of the publication of Lacks' foreign patent applications corresponding to the '809 and '906 patents. *Lacks*, 55 F. Supp. 2d at 736-37. Although referencing § 102, the district court did not specify whether its analysis was under subsection (a) or (b). While the court referred to its analysis simply as "anticipation," the correct reading of the court's opinion is that it was referring to a § 102(b) statutory bar. For example, the court noted that "the foreign patents were published more than one year before the filing of the application for the '213 patent," *Lacks*, 55 F. Supp. 2d at 736 n.18, an inquiry that is only relevant under § 102(b). In addition, "Lacks [did] not dispute that the foreign patents are [**27] prior art" before the district court, *Lacks*, 55 F. Supp. 2d at 736, nor does it on appeal. However, it is "well-settled" law that an inventor's own disclosure "will not anticipate his later invention unless that prior work is such as to constitute a statutory bar under Section 102(b)." Donald S. Chisum, 1 *Chisum On Patents* § 3.08[2][a] (1999). We therefore conclude that the district court performed its analysis under § 102(b).

On appeal, Lacks argues only that the foreign applications neither disclose nor teach the "temporary positioning and securing" means for centrally locating the cladding relative to the rim and for securing the cladding for a sufficient time to allow the adhesive to cure. We do not agree.

The specification of the '809 and '906 patents expressly discloses these two elements. The specification discloses the use of temporary positioning and securing means, including "bosses" and adhesive, to maintain the

decorative cladding in a central location until the claimed permanent adhesive can be applied. '809 patent, col. 7, lines 29-41. As the specification notes, this permits the cladding to be "accurately positioned on the wheel disk. [**28] " *Id.* col. 7, lines 43-44. The specification further discloses the use of an adhesive to "permanently" adhere the cladding to the wheel surface. *Id.* col. 8, lines 5-6. These two disclosures either contain or at least suggest [**1347] a "permanent" configuration for adhesively securing the cladding. *Id.* col. 8, lines 5-8. Therefore, we find no reversible error in the district court's grant of summary judgment of invalidity of claims 1, 3, and 8 of the '213 patent. Accordingly, we affirm that grant.

5 Lacks concedes that the foreign specification is identical to its domestic counterpart.

B. On-sale Bar of the Remaining Claims of the '213 Patent.

Under § 102(b) "[a] person shall be entitled to a patent unless . . . the invention was . . . on sale in this country, more than one year prior to the date of the application for patent in the United States. . . ." 35 U.S.C. § 102(b) (2000). A two-prong test governs the application of the on-sale bar: "First, the product must be the subject [**29] of a commercial offer for sale. . . . Second, the invention must be ready for patenting." *Pfaff v. Wells Elec., Inc.*, 525 U.S. 55, 67, 142 L. Ed. 2d 261, 119 S.Ct. 304 (1998). A § 102(b) determination is a conclusion of law based on underlying findings of fact. *Linear Tech. Corp. v. Micrel, Inc.*, 275 F.3d 1040, 1047, 61 USPQ2d 1225, 1229 (*Fed. Cir.* 2001). As such, we review the ultimate determination *de novo*, and the underlying findings for clear error. *Id.*

1. Lacks' Appeal of the Finding of On-sale Bar As a Result of Its Own Activities.

The Special Master found that Lacks' pre-critical date sales promotion activities created an on-sale bar to claims 11-13, 20-22, and 24-25 of the '213 patent. He based his finding on Lacks' extensive commercial activity more than one year before it filed its patent application. On appeal, Lacks challenges the finding. The crux of the dispute is whether the Special Master applied the proper legal standard to the first prong of the test: whether there was a "commercial offer for sale." We hold that he did not.

The standard for determining what constitutes an offer to sell sufficient to raise the on-sale [**30] bar had been subject to some confusion and change. For many years this court applied a flexible, "totality of circumstances" standard in its application of the on-sale bar. See, e.g., *Envirotech Corp. v. Westech Eng'g Inc.*, 904 F.2d 1571, 1574, 15 USPQ2d 1230, 1232 (*Fed. Cir.* 1990). Under that test "no single finding or conclusion of law

[was] a *sine qua non*" to a holding that the statutory bar arose. *Id.* As to what constituted an offer for sale, cases had held that a "definite offer for sale" was required. *Id.* at 1575. 15 USPQ2d at 1232. In interpreting that requirement at least one opinion noted that "this requirement may be met by a patentee's commercial activity which does not rise to the level of a formal 'offer' under contract law principles." *RCA Corp.*, 887 F.2d at 1062, 12 USPQ2d at 1454. Things began to change when the Supreme Court swept away the "totality of circumstances" test in *Pfaff*, 525 U.S. at 67, replacing it with the two-prong test recited above. The Court in *Pfaff* did not, however, expound upon its requirement of a "commercial offer for sale," as that was not an issue in the case.

[**31] After the Special Master issued his findings and conclusions, we clarified this standard in *Group One, Limited v. Hallmark Cards*, 254 F.3d 1041, 59 USPQ2d 1121 (Fed. Cir. 2001). In *Group One* we held that "only an offer which rises to the level of a commercial offer for sale, one which the other party could make into a binding contract by simple acceptance (assuming consideration), constitutes an offer for sale under § 102(b)." *Id.* at 1048, 59 USPQ2d at 1126. In so holding, we noted that Federal Circuit law, not state contract law, would control and that we would look to the Uniform Commercial Code ("UCC") for guidance as to whether a particular communication rose to the level of a "commercial offer for sale." *Id.* at 1047, 59 [*1348] USPQ2d at 1126; accord *Linear Tech.*, 275 F.3d at 1048, 61 USPQ2d at 1229-30 (following *Group One* and reversing the district court's invalidation under § 102(b) because the alleged activities did not constitute a contractual offer for sale under the UCC).

Turning now to the Special Master's analysis, it is clear that he performed his analysis under the wrong standard. The Special Master [**32] relied on his findings that Lacks "(1) vigorously solicited wheel manufacturers to whom Lacks could sell overlays and on whose wheels Lacks could perform its overlay-bonding method, and (2) vigorously solicited [original equipment manufacturers] to specify and purchase wheels clad by the later-patented method." For example, the Special Master relied on a Lacks eleven-page "Wheel Meeting Agenda" dated May 1993 that included a description of the product and its benefits, a plan to "validate assemblies following a plan jointly developed with [the] customer," and the approximate cost-savings as a result of achieving a chrome finish using Lacks' product. Importantly, however, the Special Master did not find this activity, nor any other of Lacks' activities, to be a commercial offer for sale as defined by contract law. Rather, he proceeded at length on the theory that "contract law principles do not govern § 102(b) issues." Particularly telling is his statement that:

Lacks is correct to the extent that there is no evidence of an offer to sell a particular cladded wheel for a specified vehicle at a specific price. But the *RCA* definition of a "definite offer" does not require [**33] that specificity: "The requirement of a definite offer excludes merely indefinite or nebulous discussion about a possible sale. While this requirement may be met by a patentee's commercial activity which does not rise to the level of a formal offer under contract law principles, a definite offer in the contract sense clearly meets this requirement."

(emphasis added). As noted above, we rejected the *RCA* non-contract approach in *Group One*, 254 F.3d at 1048, 59 USPQ2d at 1125. As the Special Master explicitly relied on a standard requiring something less than "a formal offer under contract law principles," we must hold he erred by applying the wrong legal standard in determining whether there was an offer for sale under § 102(b).

Defendants-cross appellants urge that any such error was harmless because the factors that inform whether there was a contractual offer under the UCC include course of dealing and evidence of the practice in the industry. U.C.C. § 1-205. According to the defendants, Lacks' activities amounted to a contractual offer for sale because "that is how business is done in the automotive industry." We, however, cannot so conclude as [**34] a matter of law on the record before us. Although it contains some evidence about how sales are made in the automotive industry, we cannot tell what the fact-finder would have found had he applied the correct legal standard. In fact, the only evidence of industry practice defendants point out to us on appeal is their unsupported description of their own sales experience with Ford. As a result, we vacate the Special Master's finding of invalidity and remand for further consideration. On remand the district court (or Special Master) may need to take additional evidence on the practice in the industry to determine if the activities by Lacks rise to an offer for sale under the UCC. It may also be possible to make new fact-findings based on the existing record. We leave this determination to the court's sound discretion.

2. Cross-Appeal Asserting Public Use and On-sale Bars by Hayes' and McKechnie's Activities.

The Special Master found that the activities of Hayes and McKechnie did not [**1349] give rise to a § 102(b) bar. The Special Master determined, and Lacks does not challenge, that the "the Defendants had some kind of adhesively-bonded, chrome-cladded F-150 wheel assembly on sale to, [**35] and in public use by, Ford prior to

the June 6, 1994 critical date." Nevertheless, the Special Master decided against applying the statutory bar, because he found insufficiently corroborated the testimony that the manufacture of defendants' device used the entire *claimed* method of claims 11-13, 20-22, and 24-25 of the '213 patent. Specifically, the Special Master found that Hayes and McKechnie had not clearly and convincingly proven that their device had at least one void between the overlay and the outboard surface (as required by independent claim 11, upon which claims 12-13, 20-22, and 24 depend) and wherein that void trapped air between the overlay and the wheel (as required by independent claim 25) -- i.e., whether the accused device used partial, rather than full, adhesive coverage in securing the cladding.

On appeal, Hayes and McKechnie argue that the Special Master committed legal errors: (1) by requiring each document offered to corroborate the oral testimony to independently provide a detailed description as to the extent and pattern of adhesive coverage; and (2) refusing to allow the oral testimony of one witness to corroborate that of another. Once again, even [*36] though the ultimate question under § 102(b) may be one of law, we review the underlying factual determinations for clear error. *Linear Tech.*, 275 F.3d at 1048, 61 USPQ2d at 1229. Because we conclude that the Special Master did not commit legal error in evaluating corroboration and because he did not clearly err in finding the clear and convincing standard not met, we affirm.

The requirement for corroboration of oral testimony occurs most often in the context of priority disputes, wherein we have held an inventor's testimony, standing alone, cannot support a claim of derivation (§ 102(f)) or priority (§ 102(g)). See, e.g., *Price v. Symsek*, 988 F.2d 1187, 26 USPQ2d 1031 (Fed. Cir. 1993). Corroboration is also required where, as here, the testimony is from an accused infringer concerning the sale (or offer to sell) or public use of an invention more than one year before the filing of a patent. *Finnigan Corp. v. ITC*, 180 F.3d 1354, 1366, 51 USPQ2d 1001, 1010 (Fed. Cir. 1999). Whether the asserted identity of the product with the claimed invention has been sufficiently corroborated, either by documentary or testimonial evidence, [*37] is generally measured under a "rule of reason" standard. *Woodland Trust v. Flower Tree Nursery, Inc.*, 148 F.3d 1368, 1371, 47 USPQ2d 1363, 1366 (Fed. Cir. 1998). Under this analysis, "an evaluation of all pertinent evidence must be made so that a sound determination of the credibility of [the evidence] may be reached." *Price*, 988 F.2d at 1195, 26 USPQ2d at 1037. In evaluating such evidence, we use the factors enumerated in *Woodland Trust*:

- (1) the relationship between the corroborating witness and the alleged prior user,
- (2) the time period between the event

and trial, (3) the interest of the corroborating witness in the subject matter in suit, (4) contradiction or impeachment of the witness' testimony, (5) the extent and details of the corroborating testimony, (6) the witness' familiarity with the subject matter of the patented invention and the prior use, (7) probability that a prior use could occur considering the state of the art at the time, and (8) impact of the invention on the industry, and the commercial value of its practice.

148 F.3d at 1371, 47 USPQ2d at 1366 (quoting *In re Reuter*, 670 F.2d 1015, 1021 n.9, 210 USPQ 249, 255 n.9 (CCPA 1981)). [*38]

[*1350] Addressing first the cross-corroboration of oral testimony, we conclude that the Special Master rightly refused to accept it as adequate. A review of the relevant case law reveals a clear requirement that such oral testimony by interested parties must be corroborated by documentary testimony. Starting with the Supreme Court's decision in *The Barbed Wire Patent Case*, 143 U.S. 275, 36 L. Ed. 154, 12 S. Ct. 443, 1892 Dec. Comm'r Pat. 299 (1882), and ending with our recent decision in *Union Carbide v. Shell Oil Co.*, 308 F.3d 1167, 1189, 64 USPQ2d 1545, 1560 (Fed. Cir. 2002), courts have consistently required documentary corroboration of oral testimony by interested parties presented to invalidate a patent. For example, in *Union Carbide* we held "un corroborated oral testimony by interested parties is insufficient as a matter of law to establish invalidity of [a] patent." 308 F.3d at 1189, 64 USPQ2d at 1560 (holding the oral testimony of two Shell employees was insufficient to prove anticipation because it was otherwise un corroborated) (citation omitted); accord *Juicy Whip, Inc. v. Orange Bang, Inc.*, 292 F.3d 728, 740-43, 63 USPQ2d 1251, 1259-62 (Fed. Cir. 2002) [*39] (holding oral testimony by six interested witnesses un corroborated by documentary evidence was not sufficient evidence to support a jury's finding of anticipation). The evidence at issue here consists of oral testimony by three Hayes employees, all of whom testified that all of the prototype wheels used in public or sold by Hayes had voids or gaps in the adhesive pattern. Because this oral testimony is not of such a character as to differentiate it from that rejected in the precedents cited above, we conclude that the Special Master did not err in not accepting the testimony of one witness to corroborate that of another.

We look now to defendants-cross appellants' second argument regarding corroboration. The documents in evidence were Minutes of a 1993 meeting with McKechnie, a 1993 Hayes memorandum, a 1994 Hayes

memorandum, and Hayes' *U.S. Patent No. 5,435,631* filed February 24, 1994. Hayes and McKechnie attempt to portray the Special Master's determination as requiring each document to independently provide a detailed description as to the extent and pattern of adhesive coverage, but the reasonable reading, our reading, of his findings is simply that he found the documentary evidence, [**40] as well as the witness testimony, insufficient to carry a clear and convincing burden.

The Special Master's factual determinations as to the insufficiency of the documentary evidence are thorough. He evaluated each document, discussed it thoroughly, and considered whether it corroborated the testimony of the three Hayes employees. For example, the Special Master considered the 1993 Minutes of a McKechnie meeting discussing "open areas between the overlay and the base wheel" "too general and incomplete" because "the document contains no identification of the affiliation of [the author], no connection between the project being discussed and the unmentioned Hayes F-150 prototype wheels, and no description of the adhesive application pattern or quantity." After a similar discussion of each other document in evidence, the Special Master evaluated the totality of the evidence before him and found that evidence insufficient:

To satisfy their burden of proof on this defense, defendants rely on the testimony of three of their own employees . . . and certain Hayes documentation. No testimony or documentation from any other source supports defendants' evidence. Here, even [their] [**41] documentation is incomplete, ambiguous, or contradictory . . . [Their] proofs concerning the extent of adhesive coverage on its pre-critical date composite wheels are too incomplete, speculative, uncorroborated and contradictory to fulfill their [**1351] burden of establishing correlation with the *claimed invention* by clear and convincing evidence. The relevant documents do not serve to persuasively corroborate the testimony of defendants' own witness, because the documents themselves are also too incomplete or contradictory to meet that standard.

(emphasis in original).

In light of the Special Master's complete and specific findings and his correct understanding of our case law on corroboration of oral testimony, we conclude that the Special Master committed no reversible error. We there-

fore affirm his finding that the pre-critical date activities of Hayes and McKechnie did not raise a bar under § 102(b) to claims 11-13, 20-22, and 24-25 of Lacks' '213 patent. His conclusion is affirmable as untainted by legal error and well supported by factual findings that are not clearly erroneous.

IV.

In sum, we affirm in part, vacate in part, and remand. We affirm: (1) the district [**42] court's grant of summary judgment of noninfringement of both the '809 and '906 patents and of invalidity of claims 1, 3, and 8 of the '213 patent and (2) the court's adoption of the Special Master's findings that claims 11-13, 20, and 24-25 of the '213 patent were infringed and were not proven invalid as a result of the pre-critical date public use or sale by Hayes or McKechnie. We vacate the district court's grant of summary judgment of invalidity for obviousness of all the asserted claims of the '809 and '906 patents because we need not reach an affirmative defense to infringement not embodied in a counterclaim for declaratory judgment. Finally, we vacate and remand the court's adoption of the Special Master's finding that claims 11-13, 20-22, and 24-25 of the '213 patent were invalid as a result of Lacks' pre-critical date commercial activities because he applied an outdated legal standard. On remand the district court (or Special Master) should resolve whether or not it needs to take additional evidence on sales practice in the automotive industry to determine if the sales promotion activities by Lacks rise to a contractual offer for sale (and, of course, take such evidence if [**43] necessary). If it does not again find those claims of the '213 patent invalid, the court then must determine the extent of the damages suffered by Lacks as a result of the infringement of the '213 patent by Hayes and McKechnie.

AFFIRMED-IN-PART, VACATED-IN-PART, AND REMANDED.

COSTS

No costs.

CONCUR BY: NEWMAN (In Part)

DISSENT BY: NEWMAN (In Part); CLEVENGER (In Part)

DISSENT

NEWMAN, *Circuit Judge*, concurring in part and dissenting in part.

I concur in part of the panel majority's opinion, and write separately to state my concerns with two aspects of the decision. First, in treating the on-sale issue, my colleagues have departed from the correct law. And second,

the court has created a new and unnecessary melding of prior art, anticipation, and statutory bar, in ruling *sua sponte* that the '213 patent is barred by the "laying open" of foreign counterparts of related United States patents of the same inventor.

The On-Sale Bar

The district court applied an incorrect legal standard when it held that an invalidating offer of sale under 35 U.S.C. § 102(b) may be met by a patentee's market development activity that does not meet the criteria of an offer [**44] of sale under contract law principles. As discussed in *Group One, Ltd. v. Hallmark Cards, Inc.*, 254 F.3d 1041, 59 USPQ2d 1121 (Fed. Cir. 2001), the "on sale" provision of § 102(b) is construed under general contract principles, and thus an invalidating offer must [**1352] be an offer of sale "which the other party could make into a binding sales contract by simple acceptance (assuming consideration)." *Group One*, 254 F.3d at 1048, 49 USPQ2d at 1126. In *Group One* the court cited the need for national uniformity in the law of on-sale, and stressed the importance of application of contract principles in achieving this uniformity.

My colleagues on this panel depart from this simple standard and its important policy purpose, and instead hold that individual variations in industry practice control whether there has been an offer of sale under § 102(b), whether or not the contract law-based requirement of *Group One* is met. Thus the panel majority remands for "taking additional evidence on the practice in the industry to determine if the activities by Lacks rise to an offer for sale under the UCC." Maj. op. at 22. Such industry-specific, local, and subjective criteria are a [**45] regression toward the imprecision of the discredited "totality of the circumstances," a standard purposefully rejected by the Supreme Court in *Pfaff v. Wells Electronics, Inc.*, 525 U.S. 55, 48 USPQ2d 1641, 142 L. Ed. 2d 261, 119 S. Ct. 304 (1998). Determination of whether there has been an offer of sale in terms of § 102(b) requires objective application of uniform contract law, not indulgence based on disputed local custom in the automobile tire wheel cladding business.

In developing uniform national law it is as important that the law be consistent across industry boundaries as it is across state boundaries. Such consistency is undermined by the majority's new accommodation to assertions of idiosyncratic industry patterns of dealing. While principles of federalism counsel against imposing a possibly alien legal standard upon transactions that are primarily matters of state law, such as the law of sales, the panel majority is not here invoking the guidance of state law, but of practices ostensibly peculiar to a segment of the automotive industry -- practices unencumbered by state law, indeed unknown, uncodified, and variable. The ma-

jority's remand for the purpose [**46] of ascertaining that industry practice is at variance with *Pfaff* and its implementing precedent. I must, respectfully, dissent from this novel and incorrect interpretation of the law of on-sale.

Anticipation/Statutory Bar

Lacks' own foreign applications of common inventorship are not prior art against the '213 patent, for "prior art" must be the work of "another." The court explained in *In re Land*, 54 C.C.P.A. 806, 368 F.2d 866, 151 USPQ 621 (CCP.A. 1966):

The significant words in 102(a) are "known or used by others . . . before the invention thereof by the applicant" and the parallel words in 102(e) are "application for patent by another . . . before the invention thereof by the applicant" (emphasis ours). These are the key words on which resolution of the present problem turns. The real issue is whether all the evidence, including the references, truly shows knowledge by another prior to the time appellants made their invention or whether it shows the contrary. It is a question of fact.

In re Land, 368 F.2d at 878, 151 USPQ at 632. I agree with the panel majority that the district court erred in invalidating Lacks' '213 patent based on anticipation [**47] by the laid-open German and Japanese counterparts of Lacks' copending 904,180 application. However, I do not agree that these foreign documents are a statutory bar against Lacks' '213 patent.

The 904,180 application is the basis of Lacks' United States Patents Nos. 5,577,809 and 5,636,906, here in suit. The '213 patent application was filed before the United States '809 and '906 patents were issued, but the German and Japanese counterpart applications of the '809 and [**1353] '906 patents were opened for public inspection more than one year before the '213 application was filed. It is as incongruous as it is unnecessary to convert into a statutory bar an inventor's pending foreign patent applications on an earlier development that cannot be cited as prior art.

Consecutive patent applications on various phases of inventive subject matter are quite common when research is ongoing. The laying open of foreign patent applications, before the patents are granted, is required in some countries. These foreign counterparts are not prior art because they have the same inventor. And even if they were available as prior art or bar, if the '213 patent were of common text with the 904,180 application Lacks [**48]

could be entitled to the earlier date for the common text, and if it is not of common text it is not a statutory bar to the non-common text.

The statutory rule that an inventor is not entitled to a patent if he publishes or offers to sell or publicly uses the invention more than a year before he files a patent application is designed to press the inventor into timely participation in the patent system. Thus when an invention is published, for example in a technical journal, and there is no patent filing for a year, a would-be competitor may conclude that no adverse patent rights bar his use of that technology. But when the asserted publication is a laid open foreign counterpart, no public policy requires construing this document as a dedication of all patent rights to any future enlargements and improvements of that subject matter.

Section 102 permits an inventor to present ongoing developments in successive patent applications, in the course of obstacles to the routine development of inventions. The "statutory bar" is for the purpose of assuring that the inventor's participation in the patent system is not unreasonably delayed. When the patent application is timely under United [*49] States law, it is not reasonable to subject it to an invalidating bar by foreign publication of an earlier specification that is not prior art.

The '213 patent is a method patent. It is not the same invention as described in the 904,180 application as laid open in Germany and Japan. The 904,180 specification describes the plastic overlay, its shape, composition, and the electroplating of its surface, and also describes the formation of the composite wheel by attaching the overlay to the underlying wheel. In the 904,180 specification the method of attaching the overlay to the wheel is generally stated without details, for example: "The panel 22 is adhesively bonded directly to the outboard surface of the wheel 11 either with a suitable adhesive 30 as shown, or in any other suitable manner." '809 patent, col. 9, lines 55-57. In contrast, the '213 patent describes in detail the method of attaching the overlay to the underlying wheel using a slow-curing adhesive; the pattern of adhesive application is discussed at length, with discussion of such considerations as maintaining wheel balance, minimizing weight, providing a seal to keep dirt and moisture out of the space between the overlay [*50] and the wheel, and compensating for irregularities in the underlying wheel shape. This subject matter is not in the 904,180 application, and is not in the laid open German and Japanese documents.

Also described at length in the '213 patent are the inventor's solutions to the problem of accurately locating the overlay and holding it in position for the several hours required for the permanent adhesive to cure. This is set forth in the '213 patent as the temporary attachment for which several methods are described, including using a

weaker, hot melt adhesive for the purpose, or an adhesive tape, or a [*1354] mechanical fastener. These methods are not set forth in the German and Japanese documents except for the boss used to locate and position the overlay, although without suggestion that this boss provides a temporary attachment while the adhesive cures. Indeed, the use of a slow-curing adhesive is not mentioned in the German and Japanese documents, for the 904,180 specification states no need for a temporary attachment, mechanical or otherwise.

To constitute a statutory bar, the publication must describe and enable ' the same invention as claimed in the patent alleged to be barred, in the [*51] same technologic detail. The 904,180 specification is directed to the metal-plated overlay and the composite wheel, and the '213 patent is directed to the method of assembling the overlay and the wheel, and includes operative details and embodiments not previously described. On this ground alone, the 904,180 foreign counterparts do not bar the '213 patent. No public interest is served by a law that turns earlier developments into a bar to any later patent, requiring either secrecy or the need to forego foreign patents that are promptly laid open. Such pitfalls are not required by the *Patent Act*, and should not be created by this court.

1 Lacks had argued at trial that the 904,180 application does not contain an enabling disclosure of the subject matter of the '213 patent. The district court did not decide this point, deeming the issue to be "anticipation" and stating that an anticipating reference need not be an enabling reference. That statement is incorrect. *See, e.g., Amgen, Inc. v. Hoechst Marion Roussel, Inc.*, 314 F.3d 1313, 1354, 65 USPQ2d 1385, ___ (Fed. Cir. Jan. 6, 2003) ("A claimed invention cannot be anticipated by a prior art reference if the allegedly anticipatory disclosures cited as prior art are not enabled.")

[**52] Thus I must also dissent from the court's holding that the publication of the foreign counterparts of the 904,180 application produced a statutory bar to claims of the '213 patent.

CLEVENGER, *Circuit Judge*, dissenting in part.

I join the court's opinion in all but two respects, upon which I respectfully dissent. On the first point, I disagree with the ground upon which the court affirms the judgment of the district court that the claims of the '809 and '906 are not infringed. For the reasons that follow, I would reverse the district court's interpretation of the "axial peripheral lip" limitation, and thus not rely on that limitation to sustain the judgment of noninfringement. Instead, I would apply the correct interpretation of the "wheel face outer surface" limitation to the accused products, and in so doing would employ the uncontested facts to sustain the

district court's judgment of noninfringement on this alternate ground.

Second, for the reasons stated below, I disagree with the court's affirmation of the district court's finding of infringement of claims 11-13, 20, 24, and 25 of the '213 patent. I think we should have rejected these findings as clearly erroneous. [**53] on the ground that the evidence failed to prove that the accused devices met the Ford durability testing standard set by the district court as the measurement device for assessing infringement of the "permanently secure" claim limitation.

1

I would reverse the district court's interpretation of "axial peripheral lip." However, as I conclude that the construction of "wheel face outer surface" compels a finding of noninfringement, I concur with the court's opinion on this issue.

The district court's claim construction of "axial peripheral lip" is unusual. Defining "axial peripheral lip" as the "uncovered [§1355] surface of the composite wheel that starts at the edge of the cladding, goes up and over the top of the projecting rim lip, and ends where the outer side of the rim lip merges with the tire mounting surface of the wheel rim" (emphasis in original) literally means that the accused products must meet the claim requirement that the ornamental surface "not cover" the axial peripheral lip, since the axial peripheral lip, by the district court's definition, is uncovered. This renders the district court's finding of noninfringement somewhat opaque.

The district court's claim construction [**54] views the "axial peripheral lip" as including both some portion of the wheel wall below the innermost edge of the wheel rim (facing the center of the wheel) as well as the top of the wheel rim. This is evident from both the district court's definition given above, as well as its characterization of the defendant's ornamental panel as "terminating just shy of the tip of the lip." The parties concede that the term "axial peripheral lip" has no particular meaning in the art. The standard dictionary definition of "lip" is given as "an edge, rim, or margin," or even more specifically as the "edge or margin of a hollow vessel." *Webster's 3rd New International Dictionary* 1318 (1993). Here, the diagrams indicate two separate edges on the wheel rim, an interior one facing the center of the wheel, and an exterior one facing the outside. In this context, the "axial peripheral lip" logically refers to the exterior one—the one furthest from the center of the wheel. However, there is an alternative possibility: the "axial peripheral lip" could also refer to the combination of both "edges," along with the flat portion of the wheel rim in between.

Either of these definitions is inconsistent [**55] with the district court's interpretation of "axial peripheral lip,"

specifically the inclusion in the definition of some portion of the wheel wall below the innermost edge of the wheel rim. Both are strongly supported by the prosecution history. The claims at issue were amended in response to an office rejection for unpatentability in light of the Beith reference. Beith discloses a lip 43 "formed to grip the edge of the terminal flange 29 of the multi-flanged tire mounting rim 21 and, thereby, aid in fixing the wheel cover 12 to the wheel 13." Figures 2 (see below) and 5 depict lip 43 doing precisely this—extending over and around the outer circumferential edge of the rim to "grip" the wheel.

[SEE FIGURE 2 IN ORIGINAL.]

In response to this rejection, the patentee added the requirement that the ornamental panel "not cover" the axial peripheral lip. As can be seen from Figure 2, in order to distinguish over Beith, the patentee needed to emphasize that his ornamental panel did not overlap the very outer edge of the wheel rim.

It is difficult to square the import of this amendment with a claim construction interpreting "axial peripheral lip" as including some undefined portion [**56] of the wheel wall below the interior "edge," particularly if we presume that the patentee only surrendered [§1356] enough structure to get out from under Beith.

As a result, I would reverse the district court's claim construction as to "axial peripheral lip," interpreting it instead as either the outer terminal edge or, alternatively, the highest point on the wheel rim.

I now turn to the "wheel face outer surface" claim limitation. The claim language expressly characterizes the wheel face outer surface, providing that "said web portion and said peripheral rim portion define a wheel face outer surface." '809 patent, col. 11, ll. 4-5. This appears to be a closed definition, the wheel face outer surface consisting of only two elements—the central web portion and the peripheral rim portion. The claim language further defines the axial peripheral lip as "circumscribing said peripheral rim portion," *id.* at col. 11, ll. 1-2, and requires that the ornamental panel cover "said *entire* wheel face outer surface," *id.* at col. 11, l. 10 (emphasis added).

To my mind, this claim language explicitly defines the wheel face outer surface as extending precisely up to the terminal boundary of [**57] the peripheral rim portion—the axial peripheral lip. Indeed, despite its differing construction of "axial peripheral lip," this is what the district court concluded as well. This interpretation would thus allow no portion of the peripheral rim portion to be uncovered by the ornamental panel.

Such a conclusion is problematic, however, given Figures 3 and 5 of the '809 and '906 patents. These clearly depict the ornamental panel as only covering part of the

peripheral rim portion. The above interpretation would thus read out the preferred embodiment.

As a general rule, claim interpretations, which operate to exclude the preferred embodiment, are "rarely, if ever, correct and require highly persuasive evidentiary support." *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1583, 39 USPQ2d 1573, 1578 (Fed. Cir. 1996). However, we have found that such a conclusion can be mandated by clear intrinsic evidence, such as "unambiguous" claim language. *Fleka Instrument v. O.U.R. Sci. Int'l*, 214 F.3d 1302, 1308, 54 USPQ2d 1910, 1914 (Fed. Cir. 2000). See also *Rheox, Inc. v. Fontact, Inc.*, 276 F.3d 1319, 61 USPQ2d 1368 (Fed. Cir. 2002) (reaching [*58] a claim interpretation excluding some of the preferred embodiments in light of the prosecution history). Here, the claim language is quite explicit in both defining the "wheel face outer surface" and in requiring it to be completely covered by the ornamental panel, and I would find that it constitutes an exception to the general rule.

Indeed, the linkage of the two claim requirements, that the cladding cover the *entire* wheel face outer surface, but that it *not* cover the axial peripheral lip only has meaning in the situation where the axial peripheral lip is actually providing a boundary for the overlay. Any other construction of "wheel face outer surface" would essentially mean that there is a separate interior boundary for the overlay coverage. In such a situation, the requirement that the overlay not cover the axial peripheral lip is surplusage.

Rejecting the above construction leaves open a substantial question as to what the "wheel face outer surface" actually is. Lacks's suggestion that it merely requires partial coverage of the "peripheral rim portion" is extremely unsatisfying. First, the claim language describes "said web portion and said peripheral rim portion defining [*59] a wheel face outer surface." If this language includes both elements in the definition, then full coverage is required. If it does not, Lacks's suggestion that "partial" coverage of the rim portion suffices would make the use of "entire" completely meaningless—there would be no [*1357] way to define how much coverage of the peripheral rim portion is required.

The district court used the Hayes diagram to evaluate the accused device. Lacks's brief references the same diagram. It discloses an ornamental panel terminating, as the district court found, "just shy of the tip of the lip." Neither of the parties dispute that this is an accurate representation of the accused product.

Employing the claim constructions given above, the district court's finding of noninfringement can be sustained. Even if the accused product meets the limitation requiring that the ornamental panel not cover the "axial peripheral lip," the ornamental panel does not cover the

entire wheel face outer surface, as there is a gap between the ornamental panel and the axial peripheral lip. The district court's grant of summary judgment of noninfringement of the claims of the '809 and '906 patents was correct, for the reasons [*60] I have stated.

II

Hayes and McKechnie cross-appeal the finding of infringement of the asserted claims of the '213 patent. For the reasons that follow, I agree with Hayes and McKechnie, and disagree with the contrary decision by the court affirming the district court's resolution of this issue.

Claims 11-13, 20, and 24-25 of the '213 patent require that the adhesive "permanently secure" the overlay to the wheel. '213 patent, col. 15, l. 31. The district court interpreted this to require that the adhesive be "*itself* capable of securing the overlay to the wheel during the normal useful life of the wheel" (emphasis in original). The Special Master concluded that this test was met if the adhesive:

(1) . . . satisfies the specifications set forth on the Hayes engineering drawing for the accused F-150 wheel (Exh. 42) and (2) retains sufficient retentive strength (without reliance on the mechanical locking system) to secure the overlay throughout Ford's vehicle durability testing, but with a modified upper temperature limit as discussed below.

This is a very reasonable test. Unfortunately, it is not applied. Having established the Ford vehicle durability testing as a key [*61] component of the infringement test, the Special Master's report indicates that not only is there almost no evidence as to what the Ford testing consists of, there is no evidence that there was ever any testing of the wheel on an actual vehicle.

First, the Special Master notes, "with regard to the Ford durability testing conditions, the Special Master finds the record to be somewhat incomplete. There is no description of what type of corrosion testing is performed as part of such durability tests on the vehicle, or the other durability testing performed at the Ford's Arizona Proving Ground" The report also states:

With regard to Ford's own durability testing on driven vehicles, Mr. Thomas Heck [a Hayes director] testified that these generally consisted of corrosion testing and power train durability testing. The accused Hayes wheels had to pass these

Ford tests. There was no testimony or documentation concerning what Ford would consider acceptable performance of the wheel overlays during such tests. [Emphasis added.]

In other words, having set up "Ford's vehicle durability testing" as a key element in evaluating the claim, the Special Master seems [**62] to be explicitly acknowledging that it is uncertain as to *what* that durability testing actually is.

Second, the Special Master also explicitly states that "there is no evidence, however, of *vehicle* testing on the accused wheels with the mechanical lock component of the overlay system disabled and only the adhesive component of the overlay [§1358] system operative" (emphasis in original). This, again, is somewhat problematic in light of the Special Master's own definition of the test for infringement as requiring just such a demonstration.

Lacks accurately points out that the Smithers rotary, radial fatigue, and impact testing was done (pursuant to standard testing procedure) on individual wheels with the mechanical locking system disabled. Under our deferential standard of review of factual issues, these might suffice to support a finding of infringement, had they actually comprised part of the Special Master's own test for infringement. However, as mentioned above, the Special Master explicitly required that the adhesive demonstrate retentive strength "throughout Ford's *vehicle* durability testing" (emphasis added). This language itself contains

the word "vehicle," strongly suggesting [**63] that some of the testing should be on an actual vehicle. In addition, despite the apparent uncertainty discussed above as to what Ford's durability testing consisted of, the Special Master described at least "one phase of Ford's durability testing" as consisting of an actual vehicle test drive. As cited above, the report also references "Ford's own durability testing on driven vehicles." In contrast, the alternative tests are not Ford durability tests, nor even vehicle tests, and thus are not probative under the standard of evaluation defined by the Special Master.

Third, as the Special Master noted, the only other testing performed with the mechanical lock disabled, the McKechnic "pull-off test," was "not designed as a durability test or simulation of any particular type of removal force that would be encountered in the field," much less a Ford durability test. Again, were the Special Master to have simply cited this test as evidence in favor of the fact that the accused device met the "permanently secure" claim limitation, it would likely survive our deferential standard of review. Here, however, having established the Ford durability test as an explicit standard for how to evaluate [**64] infringement, the Report's reliance on evidence, which falls outside of this standard, is both logically and legally incorrect.

We thus should conclude that the Special Master's decision as to infringement of the '213 patent claims is clearly erroneous, and that the district court accordingly should have rejected these findings and entered judgment of noninfringement of the asserted claims of the '213 patent.

LEXSEE 52 F.3D 967

**HERBERT MARKMAN and POSITEK, INC., Plaintiffs-Appellants, v.
WESTVIEW INSTRUMENTS, INC. and ALTHON ENTERPRISES, INC.,
Defendants-Appellees.**

92-1049

UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

52 F.3d 967; 1995 U.S. App. LEXIS 7593; 34 U.S.P.Q.2D (BNA) 1321

April 5, 1995, Decided

PRIOR HISTORY: [**1] Appealed from: U.S. District Court for the Eastern District of Pennsylvania. Judge Katz.

DISPOSITION: AFFIRMED.

COUNSEL: William B. Mallin. Eckert. Seamans, Cherin & McLott, of Pittsburgh, Pennsylvania. argued for plaintiffs-appellants. With him on the brief were Lewis F. Gould, Jr., Timothy P. Ryan and Brian M. Martin.

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JUDGES: Before ARCHER, Chief Judge. * and RICH. NIES, NEWMAN, MAYER, MICHEL, PLAGER, LOURIE, CLEVINGER, RADER, and SCHALL, Circuit Judges. ** Opinion for the Court filed by [**3] Chief Judge ARCHER, in which Circuit Judges RICH. NIES, MICHEL, PLAGER, LOURIE, CLEVINGER, and SCHALL join. Concurring opinions filed by Circuit Judges MAYER, and RADER. Dissenting opinion filed by Circuit Judge NEWMAN.

* Chief Judge Archer assumed the position of

Chief Judge on March 18, 1994.

** Circuit Judge Bryson joined the Federal Circuit on October 7, 1994 and has not participated in the disposition of this appeal.

OPINION BY: ARCHER

OPINION

[*970] ARCHER, Chief Judge.

Herbert Markman and Positek, Inc. (collectively referred to as Markman) appeal from the judgment of the United States District Court for the Eastern District of Pennsylvania, Civil Action No. 91-0940 (entered Oct. 1, 1991), that Westview Instruments, Inc. and Althon Enterprises, Inc. (collectively referred to as Westview) did not infringe claims 1 or 10 of *United States Reissue Patent No. 33,054*, notwithstanding the jury's verdict to the contrary. We have ordered that this case be reheard in banc. ¹ We affirm the judgment of noninfringement. In doing so, we conclude that the interpretation and construction of patent claims, which define the scope of the patentee's rights under the patent, is a matter [*4] of law exclusively for [*971] the court. Thus, in this case the district court properly discharged its obligation to delineate the scope of the claim on motion for judgment as a matter of law when the jury had rendered a verdict that was incompatible with a proper claim construction.

1 A panel of this court heard oral argument in the appeal. On November 5, 1993, this court ordered sua sponte that the appeal be reheard in banc. The court also requested additional briefing and has been helped by the supplemental briefs of the parties and by the several briefs amicus curiae.

I.

A. In the dry-cleaning industry, articles of clothing typically are taken in from customers, recorded in some form, and then sorted according to criteria such as type of clothing and type of cleaning required. During the sorting process, articles of clothing belonging to one customer may be combined together, and also may be combined with similar clothing belonging to other customers, in order to make the cleaning process more efficient [*5] and less costly. After the articles of clothing are sorted, they may be cleaned in the same establishment or transported to another establishment for cleaning. During the cleaning process, the articles of clothing move

through different locations in the establishment. After cleaning, of course, the articles of clothing must be unsorted and returned to the respective customers.

Markman is the inventor named in and the owner of *United States Reissue Patent No. 33,054* (the '054 patent), titled "Inventory Control and Reporting System for Drycleaning Stores." Markman's original patent No. 4,550,246 was reissued and the reissue is the patent in suit. Positek is a licensee under the patent in the dry-cleaning business.

The '054 patent is directed to an inventory-control system that assertedly solves inventory-related problems prevalent in the dry-cleaning business. As the '054 patent specification discusses, articles of clothing can be lost in the sorting and cleaning process, and it has been found in the dry-cleaning business that even a small percentage-loss of articles of clothing will generate great consumer dissatisfaction. Also, attendant personnel might send clothing through the [*6] cleaning process but pocket the proceeds of the transactions and destroy or fail to do the appropriate paperwork, thereby servicing the customers adequately but stealing from the business. In such circumstances it is difficult for the business owner to locate the loss of profits and to deter such activities.

The invention of the '054 patent is described in detail in the specification which states that the inventory control system is "capable of monitoring and reporting upon the status, location and throughput of inventory in an establishment," and that by using the invention of the '054 patent, "the progress of articles through the laundry and drycleaning system can be completely monitored." In this way, the business owner can "reconcile[] [the inventory] at any point in the sequence" of sorting, cleaning, and unsorting clothing, and can "detect and localize spurious additions to inventory as well as spurious deletions therefrom."

According to the specification's description of the invention, as customers bring in their articles of clothing for cleaning, the articles are accumulated by an attendant. The attendant enters information on a keyboard identifying at least the particular [*7] customer, the type of articles being deposited, and the particular cleaning operations to be performed. Other information may be entered depending upon the complexity of the system.

A data processor stores and processes the data

entered by the attendant, associating sequential customers and transactions with a unique indicium such as a number. The processor is connected to a printer that generates a written record of the stored information associated with the particular customers and transactions. No transaction can proceed without generating a written record, thereby ensuring that each transaction is accounted for.

The patent specification specifies that the written record is to have different portions. For example, the written record includes a customer ticket or receipt, a management ticket copy, and a plurality of article tags. The article tags are to be attached to individual articles or groups of articles in inventory. The management ticket and the article tags contain a bar code and a unique indicium such as a number associated with a customer, transaction, and other information. The bar code records are custom printed sequentially, as sequential customer transactions occur. [**8] [972] The tags thus not only associate a bar code with transactions, but also with an article or group of articles, persons, physical items in inventory, and other information again depending upon the system's complexity.

Optical detector devices are then used to read the bar code indicia, and they may be located at various points in the cleaning process, including at least at the customer service station. The articles are logged through a particular station by scanning the tags containing the bar codes with the detector. The bar codes are used to call up information associated with the customer or transaction, and used to generate reports containing information such as the location of articles within the system, the number of articles located at a particular point in the system, etc. Obviously, the more optical detectors, the tighter the inventory control. After the articles have been processed, optical detection of the bar codes can be used to reorganize the articles into customer packages. The overall result is that additions to and deletions from inventory can be located -- wherever an optical detector appears -- and can be associated with particular customers and articles of clothing. [**9] In this way the inventory can be fully reconciled.

In claim 1, the only independent claim involved in this appeal, Markman claims his invention to be (emphasis added):

1. The inventory control and reporting

system, comprising:

a data input device for manual operation by an attendant, the input device having switch means operable to encode information relating to sequential transactions, each of the transactions having articles associated therewith, said information including transaction identity and descriptions of each of said articles associated with the transactions;

a data processor including memory operable to record said information and means to maintain an inventory total, said data processor having means to associate sequential transactions with unique sequential indicia and to generate at least one report of said total and said transactions, the unique sequential indicia and the descriptions of articles in the sequential transactions being reconcilable against one another,

a dot matrix printer operable under control of the data processor to generate a written record of the indicia associated with sequential transactions, the [**10] written record including optically-detectable bar codes having a series of contrasting spaced bands, the bar codes being printed only in coincidence with each said transaction and at least part of the written record bearing a portion to be attached to said articles; and,

at least one optical scanner connected to the data processor and operable to detect said bar codes on all articles passing a predetermined station,

whereby said system can detect and localize spurious additions to inventory as well as spurious deletions therefrom.

In dependent claim 10, Markman specifies that in the invention of claim 1, the input device is an alpha-numeric keyboard wherein single keys may be used to enter attributes of items being entered.

B. Markman sued Westview and Althoff for infringement of claims 1, 10, and 14 of the '054 patent. Westview makes and sells specially electronic devices, including the system accused of being an infringement of the '054 patent. Althoff owns and operates two dry-cleaning sites and uses Westview's device in one of its shops.

The accused Westview device consists of two separate pieces of equipment, which Westview calls the DATAMARK [**11] and the DATASCAN. The DATAMARK is a stationary unit comprising a keyboard, electronic display, processor, and printer. When a customer brings articles of clothing in for cleaning, an attendant enters on a keypad information about the customer, articles to be cleaned, and charges for the cleaning. The DATAMARK then prints a bar-coded ticket or invoice listing the information about the customer, the clothes to be cleaned, and the charges for the cleaning. The DATAMARK retains permanently in memory only the invoice number, date, and cash total. The DATAMARK is thus used to print bar-coded [**973] tickets for the articles and to retain an invoice list.

The DATASCAN is a portable unit comprising a microprocessor and an optical detector for reading bar-coded tickets or invoices at any location in the dry-cleaning establishment. To use the DATASCAN, first the invoice list is transferred from the DATAMARK to the DATASCAN. Then, the DATASCAN is carried about to read the bar-codes on tickets or invoices in the establishment. As it does this, it can report any discrepancy between the particular invoice read (or not read) and the invoice list. In this way the DATASCAN identifies extra or missing invoices [**12] .

C. At a jury trial on the issue of infringement, Markman presented the testimony of four witnesses: (1) an expert on bar-code technology who testified about the manner in which Westview's device operates, (2) Markman, the inventor, who testified about his patent and its claims, (3) a "patent expert" -- that is, a practicing patent lawyer -- who testified in his capacity as a patent lawyer about the meaning of the claim language and how the claims allegedly read on the accused system, (4) an accountant who testified as to the number of allegedly infringing systems sold. Also included in evidence were the actual Westview device and its operating manuals, brochures, and computer program. At the conclusion of Markman's case in chief, Westview moved for a directed

verdict.² The district court deferred ruling on the motion. Westview then presented the testimony of a single witness, its president, who demonstrated the operation of the Westview device and testified about its capabilities.

2 "Directed verdict" has since been renamed "judgment as a matter of law" and is hereinafter referred to as such. See *Fed. R. Civ. P. 50*.

[**13] The district court charged the jury on infringement, instructing it to "determine the meaning of the claims . . . using the relevant patent documents including the specifications, the drawings and the file histories." The court continued that "also relevant are other considerations that show how the terms of a claim would normally be understood by those of ordinary skill in the art." The court then instructed the jury to compare the claims with the Westview device to determine if it infringes. The jury returned answers to general interrogatories finding that Westview infringed independent claim 1 and dependent claim 10 but did not infringe independent claim 14.³

3 The finding of noninfringement of independent claim 14 is not at issue in this appeal.

The district court then heard argument on and granted Westview's deferred motion for judgment as a matter of law (JMOL). Stating that claim construction was a matter of law for the court, the district court provided its construction of the claims. The court held [**14] that "inventory" as used in the claims meant "articles of clothing" and not simply transaction totals or dollars. Under the district court's construction, the claims require that the system be able to track articles of clothing through the dry-cleaning process, detect and localize missing and additional articles of clothing, and generate reports about the status and location of the articles of clothing. It is undisputed that Westview's system is incapable of doing this because it does not retain information regarding the particular articles of clothing, but rather only a listing of the invoices and the cash total of the inventory. Among other things, the court concluded that Westview's device does not have the "means to maintain an inventory total" required by claim 1, and cannot "detect and localize spurious additions to inventory as well as spurious deletions therefrom," and directed a verdict of noninfringement of claims 1 and 10.

II.

A. Markman appealed from the district court's grant of JMOL of noninfringement of claims 1 and 10. In this court, Markman's principal argument is that the district court erred in granting the JMOL, stating:

Requiring the jury to interpret [**15] certain terms of the patent was quite proper, and indeed required, as the meaning of certain terms of Claim 1 was contested at trial. See *Palumbo v. Don-Joy Co.* [sic.], 762 F.2d 969, 974, 226 U.S.P.Q. (BNA) 5, 8 (Fed. Cir. 1985) (when the meaning of a claim term is [**974] disputed a "factual question arises, and construction of the claim should be left to the trier or jury under appropriate instruction.")

....

Despite entrusting the jury with interpreting the claim, the trial court thwarted [Markman's] right to a jury determination of this factual issue simply because it disagreed with the jury's interpretation. At the root of the district court's astonishing opinion was its mistaken belief that it had a license to re-find the facts and reinterpret the claims as if there were no jury and no jury verdict because, in different appropriate cases, claims of a patent may be interpreted as a matter of law. . . .

... Indeed the deference due to a jury's claim construction was stated positively by this court in *Tol-O-Matic [.] Inc. v. Prona Produkt-Und Marketing Gesellschaft m.b.H.*, 945 F.2d 1546, 1550-52, 20 U.S.P.Q.2D (BNA) 1332, 1336-38 (Fed. Cir. 1991). . . .

[**16]

... While in appropriate circumstances, claims may be interpreted as a matter of law by the court, in this case the jury was asked to and did interpret the patent as part of reaching its finding of infringement. Once the jury was assigned this task and

rendered its verdict, the trial court was not permitted to discredit the verdict and substitute its evaluation of the evidence for the jury's.

In particular, Markman argues that the district court erroneously substituted its construction of the disputed claim term "inventory" for the jury's implied construction.

As the above quotation shows, Markman contends that the jury was properly given the question of claim construction and that the jury's claim construction and verdict thereon is supported by substantial evidence. The evidence Markman points to in support of the jury verdict is not the language of the patent specification or prosecution history, but rather Markman's own testimony as inventor and the testimony of his patent expert. He also relies on use of the word "inventory" in Westview's product literature and on the testimony of its president. Markman's position essentially is that all the evidence [**17] of the meaning of the word "inventory," from the patent, prosecution history, experts, and documents, was properly lumped together and submitted to the jury for it to resolve what in fact is the meaning of "inventory," and that the result of this process is entitled to highly deferential review both by the trial court on motion for JMOL and by this court on appeal from the grant or denial of JMOL.

Setting aside the issue of who properly determines the ultimate scope of the claims, Markman further argues that the district court misconstrued the term "inventory" to mean "articles of clothing" in addition to "cash" or "invoice totals" in order to find that claim 1 defines a system that "tracks" articles of clothing through the dry-cleaning process. Markman says that based on all the evidence presented at trial the term "inventory" as used in claim 1 means "articles of clothing" or "dollars" or "cash" or "invoices," and is not necessarily limited to a construction that always includes "articles of clothing."

Westview on the other hand focuses almost exclusively on the patent and prosecution history to inform the meaning of "inventory." It argues that the patent and prosecution [**18] history are in conflict with the testimony and other evidence relied on by Markman and therefore Markman's evidence should be disregarded by the court in favor of the meaning revealed by the patent. This task of assigning the meaning to "inventory,"

and the meaning assigned are, in the view of Westview, all legal matters for the court and subject to de novo review.

It is undisputed that when the claim term "inventory" is construed to mean "the physical articles of clothing" or to require "articles of clothing" as part of its meaning, the Westview system lacks "means to maintain an inventory total" and does not and cannot "detect and localize spurious additions to inventory as well as spurious deletions therefrom," as claim 1 would thus require. ⁴ [975] Markman's appeal therefore turns on (1) whether the district court acted properly by construing the term "inventory" as a matter of law notwithstanding a contrary construction given the term by some of Markman's witnesses and by the jury, and (2) regardless of whether the court or the jury determines the scope of the claims, whether the term "inventory" requires as part of its meaning "articles of clothing."

4 Markman makes much of the distinction between tracking "individual" articles of clothing and tracking "batches" of clothing and says the district court erroneously restricted the invention to the former. For purposes of this appeal, this distinction is irrelevant because Westview's system tracks neither individual articles of clothing nor batches of clothing.

[**19] B. Where a party moves for JMOL in a case that has been tried to a jury, the district court

must determine whether there exists evidence of record upon which a jury might properly have returned a verdict in [the non-movant's] favor when the correct legal standard is applied. If there is not, [the movant] was entitled to have the question removed from the jury and decided as a matter of law.

Jamesbury Corp. v. Litton Indus. Prods., Inc., 756 F.2d 1556, 1560, 225 U.S.P.Q. (BNA) 253, 257 (Fed. Cir. 1985) (emphasis added). On appeal, we review de novo the correctness of the district court's grant of JMOL by reapplying the JMOL standard. *Id.*; see *Neveill Cos. v. Kenney Mfg. Co.*, 864 F.2d 757, 762, 9 U.S.P.Q.2D (BNA) 1417, 1421 (Fed. Cir. 1988).

Embedded within the above description of JMOL are two aspects. Factual findings made by the jury in arriving

at its verdict are to be upheld unless the party moving for JMOL shows that (when the correct legal standard is applied) there is not substantial evidence to support a finding in favor of the nonmovant. See *Read Corp. v. Portec, Inc.*, 970 F.2d 816, 821, 23 U.S.P.Q.2D (BNA) 1426, 1431 (Fed. Cir. 1992).

While the jury's factual [**20] findings receive substantial deference on motion for JMOL, the legal standards that the jury applies, expressly or implicitly, in reaching its verdict are considered by the district court and by the appellate court de novo to determine whether those standards are correct as a matter of law. *Baltimore & Carolina Line, Inc. v. Redman*, 295 U.S. 654, 660, 79 L. Ed. 1636, 55 S. Ct. 890 (1935) ("[A] federal court may take a verdict subject to the opinion of the court on a question of law . . ."). *Read Corp.*, 970 F.2d at 821, 23 U.S.P.Q.2D (BNA) at 1431; see *Elder v. Holloway*, 127 L. Ed. 2d 344, 114 S. Ct. 1019, 1023 (1994) ("Question[s] of law . . . must be resolved de novo on appeal."); *Bradley v. Secretary of Health and Human Servs.*, 991 F.2d 1570, 1574 n.3 (Fed. Cir. 1993) ("Legal conclusions are, of course, always reviewed de novo."); *Heisig v. United States*, 719 F.2d 1153, 1158 (Fed. Cir. 1983); see also *Bose Corp. v. Consumers Union of United States, Inc.*, 466 U.S. 485, 501, 80 L. Ed. 2d 502, 104 S. Ct. 1949 (1984) ("An appellate court[] [has] power to correct errors of law, including those that may infect a so-called mixed finding of law and fact, or a finding of fact that is predicated on a misunderstanding of the governing rule [**21] of law."). Notwithstanding the jury's verdict, on review of a motion for JMOL the court retains the power and duty to say what the correct law is, and then to examine the factual issues submitted to the jury and determine whether findings thereon are supported by substantial evidence and support the verdict under the law. *Read Corp.*, 970 F.2d at 821, 23 U.S.P.Q.2D (BNA) at 1431; *Senmed, Inc. v. Richard-Allan Medical Indus., Inc.*, 888 F.2d 815, 818, 12 U.S.P.Q.2D (BNA) 1508, 1511 (Fed. Cir. 1989); *Cornell v. Sears, Roebuck & Co.*, 722 F.2d 1542, 1550, 220 U.S.P.Q. (BNA) 193, 200 (Fed. Cir. 1983). ⁵

5 The general rule is that in reviewing the law on a properly laid and renewed motion for JMOL, the appellate court is not bound by the instructions given the jury, even if they were not objected to. *Boyle v. United Technologies, Corp.*, 487 U.S. 500, 513-14, 101 L. Ed. 2d 442, 108 S. Ct. 2510 (1988) (unobjected to jury instructions

are not law of the case for purposes of JMOL); *City of St. Louis v. Praprotnik*, 485 U.S. 112, 120, 99 L. Ed. 2d 107, 108 S. Ct. 915 (1988); 9 Charles A. Wright & Arthur R. Miller, *Federal Practice and Procedure* § 2537, at 599-600 (1971). We therefore reject Markman's argument that we must defer to the jury's claim construction simply because the district court instructed the jury to interpret the claims and Westview did not object to this instruction. See *Wright & Miller*, supra, § 2521.

[**22] [976] Since matters of law must be reviewed de novo and matters of fact must be accorded substantial deference, the review of a grant of JMOL requires careful distinction between fact and law. In this case which involves claim construction and a grant of JMOL of noninfringement based on claim construction, in order to determine whether that grant was correct, we must distinguish law from fact.

C. An infringement analysis entails two steps. The first step is determining the meaning and scope of the patent claims asserted to be infringed. *Read Corp.*, 970 F.2d at 821, 23 U.S.P.Q.2D (BNA) at 1431. The second step is comparing the properly construed claims to the device accused of infringing. *Id.* It is the first step, commonly known as claim construction or interpretation, that is at issue in this appeal.

6 The dissenting opinion draws a distinction between claim interpretation and claim construction based on the distinction made in contract law. We do not make the same distinction for, in our view, the terms mean one and the same thing in patent law. See *Senmed, Inc. v. Richard-Allan Medical Indus., Inc.*, 888 F.2d 815, 818, 12 U.S.P.Q.2D (BNA) 1508, 1511 (Fed. Cir. 1989); *Intervet Am., Inc. v. Kee-Vet Labs., Inc.*, 887 F.2d 1050, 1053, 12 U.S.P.Q.2D (BNA) 1474, 1476 (Fed. Cir. 1989). For consistency we use the term construction when referring to the first step in an infringement analysis.

[**23] III.

A. The opinions of this court have contained some inconsistent statements as to whether and to what extent claim construction is a legal or factual issue, or a mixed issue. Markman cites some of our cases which have

statements that claim construction may be a factual or mixed issue, including *Tol-O-Matic, Inc. v. Proma Produkt-Und Mktg. Gesellschaft m.b. H.*, 945 F.2d 1546, 1550-52, 20 U.S.P.Q.2D (BNA) 1332, 1336-38 (Fed. Cir. 1991), and *Palumbo v. Don-Joy Co.*, 762 F.2d 969, 974, 226 U.S.P.Q. (BNA) 5, 8 (Fed. Cir. 1985).

At its inception, the Federal Circuit held that claim construction was a matter of law. Our first opinion deciding a question of claim construction, *SSIH Equip. S.A. v. United States Int'l Trade Comm'n*, 718 F.2d 365, 376, 218 U.S.P.Q. (BNA) 678, 688 (Fed. Cir. 1983) (originally reported at 713 F.2d 746 at 746-60), said so explicitly, resting on the authority of *Winans v. Denmead*, 56 U.S. (15 How.) 330, 14 L. Ed. 717 (1854). Cases following *SSIH* include *Kalman v. Kimberly-Clark Corp.*, 713 F.2d 760, 770-71, 218 U.S.P.Q. (BNA) 781, 788 (Fed. Cir. 1983), and *Fromson v. Advance Offset Plate, Inc.*, 720 F.2d 1565, 1569-71, 219 U.S.P.Q. (BNA) 1137, 1140-42 (Fed. Cir. 1983), and *SRI Int'l v. Matsushita Elec. [**24] Corp. of America*, 775 F.2d 1107, 1118-22, 1138-40, 227 U.S.P.Q. (BNA) 577, 583-86, 596-97 (Fed. Cir. 1985) (in banc).

The first Federal Circuit case to deviate from this precedent and state that claim construction may have underlying factual inquiries that must be submitted to a jury was *McGill Inc. v. John Zink Co.*, 736 F.2d 666, 221 U.S.P.Q. (BNA) 944 (Fed. Cir. 1984). In *McGill*, the court stated that

if . . . the meaning of a term of art in the claims is disputed and extrinsic evidence is needed to explain the meaning, construction of the claims could be left to a jury. *Envirotech Corp. v. Al George, Inc.*, 730 F.2d 753 (Fed. Cir. 1984); cf. *Hong Kong Export Credit Insurance Corp. v. Dun & Bradstreet*, 414 F. Supp. 153, 157 (S.D.N.Y. 1975). In the latter instance, the jury cannot be directed to the disputed meaning for the term of art. Cf. *Butler v. Local Union 823, International Brotherhood of Teamsters*, 514 F.2d 442, 452 (8th Cir.), cert. denied, 423 U.S. 924, 96 S. Ct. 265, 46 L. Ed. 2d 249 (1975).

Id. at 672, 221 U.S.P.Q. (BNA) at 948. A review of the authority relied on for this statement of law, however, is revealing. In contradistinction to the proposition [**25]

for which it is cited. Envirotech in fact states "the patented invention as indicated by the language of the claims must first be defined (a question of law), and then the trier must judge whether the claims cover the accused device (a question of fact)." 730 F.2d at 758. 221 U.S.P.Q. (BNA) at 477 (emphasis added). Thus Envirotech is entirely consistent with the earlier precedent.⁷ The other [*977] two cases relied upon, the district court opinion in *Hong Kong Export Credit* and the Eighth Circuit opinion in *Butler*, are contract cases. Thus this court's earliest pronouncement of jury triable fact issues in claim construction cites no authoritative support.

7 The views of the "special concurrence" in *Envirotech*, contending that the claims on appeal had been properly submitted to the jury and were not reviewed de novo on appeal, were not adopted by the majority opinion. 730 F.2d at 763, 221 U.S.P.Q. (BNA) at 481 (Baldwin, J., specially concurring). Accordingly, the concurrence's "spin" on the case is not the position of the court.

[**26] Cases following the McGill view of claim construction provide no firmer basis for the view. Nevertheless, a significant line of cases has developed in our precedent stating (although rarely holding) that there may be jury triable fact issues in claim construction, relying on McGill (and its erroneous interpretation of *Envirotech*) and its progeny. See *Bio-Rad Labs, Inc. v. Nicolet Instrument Corp.* 739 F.2d 604, 614, 222 U.S.P.Q. (BNA) 654, 661 (Fed. Cir. 1984) (relying on *Envirotech*); *Palumbo v. Don-Joy Co.* 762 F.2d 969, 974, 226 U.S.P.Q. (BNA) 5, 8 (Fed. Cir. 1985) (no authority cited);⁸ *Moeller v. Ionetics, Inc.* 794 F.2d 653, 657, 229 U.S.P.Q. (BNA) 992, 995 (Fed. Cir. 1986) (citing *Palumbo*); *I.I.H. Robertson, Co. v. United Steel Deck, Inc.* 820 F.2d 384, 389, 2 U.S.P.Q.2D (BNA) 1926, 1929 (Fed. Cir. 1987) (citing *Moeller* and *Palumbo*); *Perini America, Inc. v. Paper Converting Machine Co.* 832 F.2d 581, 584, 4 U.S.P.Q.2D (BNA) 1621, 1624 (Fed. Cir. 1987) (citing *Palumbo* and McGill). The language from these opinions, to the effect that disputes over the meaning of claim language may raise factual questions reviewed for substantial evidence or clear error as the case may be, [*27] continued to propagate through our precedent. This line of cases culminated in *Tol-O-Matic, Inc. v. Prona Produkt-Und Mktg. Gesellschaft m.b.H.*, 945 F.2d 1546, 20 U.S.P.Q.2D (BNA) 1332 (Fed. Cir. 1991), in which this

court affirmed a denial of a motion for judgment n.o.v., reasoning that

8 *Palumbo* also presented the issue of construction of means-plus-function claim limitations under 35 U.S.C. § 112, para. 6. As that issue is not before us today, we express no opinion on the issue of whether a determination of equivalents under § 112, para. 6 is a question of law or fact.

interpretation of the claim words [at issue] required that the jury give consideration and weight to several underlying factual questions, including in this case the description of the claimed element in the specification, the intended meaning and usage of the claim terms by the patentee, what transpired during the prosecution of the patent application, and the technological evidence offered by the expert witnesses.

Id. [*28] at 1550, 20 U.S.P.Q.2D (BNA) at 1336.

On the other hand, a second line of Federal Circuit opinions has continued to follow the earlier pronouncements that claim construction is strictly a question of law for the court. See *Specialty Composites v. Cabot Corp.*, 845 F.2d 981, 986, 6 U.S.P.Q.2D (BNA) 1601, 1604 (Fed. Cir. 1988); *Senmed*, 888 F.2d at 818-20, 12 U.S.P.Q.2D (BNA) at 1511-13; *Unique Concepts, Inc. v. Brown*, 939 F.2d 1558, 1561-63, 19 U.S.P.Q.2D (BNA) 1500, 1503-04 (Fed. Cir. 1991); *Intellicall, Inc. v. Phonometrics, Inc.*, 952 F.2d 1384, 1387-88, 21 U.S.P.Q.2D (BNA) 1383, 1386-87 (Fed. Cir. 1992); *Read Corp. v. Portec, Inc.*, 970 F.2d 816, 822-23, 23 U.S.P.Q.2D (BNA) 1426, 1432-33 (Fed. Cir. 1992).

B. Notwithstanding the apparent inconsistencies in our opinions, the Supreme Court has repeatedly held that the construction of a patent claim is a matter of law exclusively for the court. *Hogg v. Emerson*, 47 U.S. (6 How.) 437, 484, 12 L. Ed. 505 (1848); *Silshy v. Foote*, 55 U.S. (14 How.) 218, 225, 14 L. Ed. 394 (1853); *Winans v. Denmead*, 56 U.S. (15 How.) at 338; *Winans v. New York & Erie R.R. Co.*, 62 U.S. (21 How.) 88, 100, 16 L. Ed. 68 (1859); *Bischoff v. Weihered*, 76 U.S. (9 Wall.) 812, 816, 19 L. Ed. 829 (1870); *Heald v. Rice*, 104 U.S. 737, 749,

26 L. Ed. 910 [*29] (1882); *Coupe v. Royer*, 155 U.S. 565, 579-80, 39 L. Ed. 263, 15 S. Ct. 199 (1895); *Market St. Cable Ry. Co. v. Rowley*, 155 U.S. 621, 625, 39 L. Ed. 284, 15 S. Ct. 224 (1895); *Singer Mfg. Co. v. Cramer*, 192 U.S. 265, 275, 48 L. Ed. 437, 24 S. Ct. 291 (1904); see also 2 William C. Robinson, *The Law of Patents for Useful Inventions* § 731, at 481 (1890) (hereinafter Robinson on Patents); George T. Curtis, *A Treatise on the Law of Patents for Useful Inventions* § 222, at 251 (4th ed. 1873) (hereinafter Curtis on Patents).⁹ [*978] Time and again the Supreme Court has itself resolved disputes over the construction of claims as a matter of law. See, e.g., *Coupe v. Royer*, 155 U.S. at 574-75, 579 (stating that court defines the scope of the claims and reversing the trial judge's erroneous claim construction); *Keystone Bridge Co. v. Phoenix Iron Co.*, 95 U.S. 274, 275, 24 L. Ed. 344 (1877) (resolving claim construction contentions on the basis of an exhaustive review of the patent and its discussion of the relevant art).

9 The Supreme Court has also in equity cases considered the scope of a patent to be a matter of law, not subject to deferential review. See *Seymour v. Osborne*, 78 U.S. (11 Wall.) 516, 546, 20 L. Ed. 33 (1871); *Bates v. Coe*, 98 U.S. 31, 38-39, 25 L. Ed. 68 (1879); *Goodyear Dental Vulcanite Co. v. Davis*, 102 U.S. 222, 224, 26 L. Ed. 149 (1880); *Exhibit Supply Co. v. Ace Potents Corp.*, 315 U.S. 126, 134, 52 U.S.P.Q. (BNA) 275, 279, 86 L. Ed. 736, 62 S. Ct. 513 (1942).

[**30] The reason that the courts construe patent claims as a matter of law and should not give such task to the jury as a factual matter is straightforward: It has long been and continues to be a fundamental principle of American law that "the construction of a written evidence is exclusively with the court." *Levy v. Gadsby*, 7 U.S. (3 Cranch) 180, 186, 2 L. Ed. 404 (1805) (Marshall, C.J.); *Eddy v. Prudence Bonds Corp.*, 165 F.2d 157, 163 (2d Cir. 1947) (Learned Hand, J.) ("Appellate courts have untrammelled power to interpret written documents."); 4 Samuel Williston, *Williston on Contracts* § 601, at 303 (3d ed. 1961) (hereinafter Williston on Contracts) ("Upon countless occasions, the courts have declared it to be the responsibility of the judge to interpret and construe written instruments, whatever their nature.") (footnotes omitted).

The patent is a fully integrated written instrument. By statute, the patent must provide a written description

of the invention that will enable one of ordinary skill in the art to make and use it. 35 U.S.C. § 112, para. 1. Section 112, para. 2, also requires the applicant for a patent to conclude the specification with claims "particularly pointing [*31] out and distinctly claiming the subject matter which the applicant regards as his invention." It follows, therefore, from the general rule applicable to written instruments that a patent is uniquely suited for having its meaning and scope determined entirely by a court as a matter of law. *Bates v. Coe*, 98 U.S. at 38 ("The claims of the patent, like other provisions in writing, must be reasonably construed . . ."); *Merrill v. Yeomans*, 94 U.S. 568, 571, 24 L. Ed. 235 (1877) (construing the patent in part by applying "well-settled rules of construing all instruments"); accord *Doble Eng'g Co. v. Leeds & Northrup Co.*, 134 F.2d 78, 83, 56 U.S.P.Q. (BNA) 426, 432 (1st Cir. 1943) ("It appears to be firmly established that . . . a patent is subject to the same general rules of construction as any other written instrument."); 2 Robinson on Patents, supra, § 732, at 481-82; 1 Anthony W. Deller, *Patent Claims* § 21 (2d ed. 1971).

There is much wisdom to the rule that the construction of a patent should be a legal matter for a court. A patent is a government grant of rights to the patentee. 35 U.S.C. § 154. By this grant, the patentee owns the rights for a limited time to exclude others from [*32] making, using, or selling the invention as claimed. *Id.*; see *Bloomer v. McQuewan*, 55 U.S. (14 How.) 539, 548, 14 L. Ed. 532 (1852). Infringement of the patentee's right to exclude carries with it the potential for serious consequences: The infringer may be enjoined and required to pay increased damages, costs and attorney fees. See 35 U.S.C. §§ 283-285. When a court construes the claims of the patent, it "is as if the construction fixed by the court had been incorporated in the specification," Curtis on Patents, supra, § 452, at 609, and in this way the court is defining the federal legal rights created by the patent document.

Further, it is only fair (and statutorily required) that competitors be able to ascertain to a reasonable degree the scope of the patentee's right to exclude. *Merrill v. Yeomans*, 94 U.S. at 573-74 ("It seems to us that nothing can be more just and fair, both to the patentee and to the public, than that the former should understand, and correctly describe, just what he has invented, and for what he claims a patent."); *Hogg v. Emerson*, 47 U.S. (6 How.) at 484. They may understand what is the scope of

the patent [*979] owner's rights by obtaining the patent [**33] and prosecution history -- "the undisputed public record," *Senmed*, 888 F.2d at 819 n.8, 12 U.S.P.Q.2D (BNA) at 1512 n.8 -- and applying established rules of construction to the language of the patent claim in the context of the patent. Moreover, competitors should be able to rest assured, if infringement litigation occurs, that a judge, trained in the law, will similarly analyze the text of the patent and its associated public record and apply the established rules of construction, and in that way arrive at the true and consistent scope of the patent owner's rights to be given legal effect.

Arriving at a true and consistent scope of the claims also works to the benefit of the patentee, as Professor Robinson eloquently observed:

To treat the nature of the patented invention as a matter of fact, to be inquired of and determined by a jury, would at once deprive the inventor of the opportunity to obtain a permanent and universal definition of his rights under the patent, and in each case of infringement it would subject him to the danger of false interpretation, from the consequences of which he could not escape. By confiding this duty to the court, however, its decision as to the nature [**34] of the patented invention becomes reviewable to the same extent as any other legal question, and when his patent has received the interpretation of the Supreme Court of the United States the inventor can maintain his privilege, as thus interpreted, against all opponents without further controversy in reference to its true limitations.

2 Robinson on Patents, supra, § 733, at 483-84.

We therefore settle inconsistencies in our precedent and hold that in a case tried to a jury, the court has the power and obligation to construe as a matter of law the meaning of language used in the patent claim. As such, "[a] patent covers the invention or inventions which the court, in construing its provisions, decides that it describes and claims." 3 Robinson on Patents, supra, § 1019, at 247. Because claim construction is a matter of law, the construction given the claims is reviewed de

novo on appeal. Accordingly, Markman's principal argument that the district court erred in taking the issue of claim construction away from the jury is itself legally erroneous.

IV.

A. Markman argues that the jury's implied construction of the claims is correct and that the district [**35] court's construction of the claims is wrong, thereby necessitating that this court reinstate the jury's verdict. Markman contends that the jury properly considered all the evidence of record on the disputed claim term "inventory" in reaching its implicit conclusion that the term does not require articles of clothing. We find that these arguments are not convincing and we reach a conclusion that is in accord with the district court's construction of the claims.

"To ascertain the meaning of claims, we consider three sources: The claims, the specification, and the prosecution history." *Unique Concepts, Inc. v. Brown*, 939 F.2d 1558, 1561 (Fed. Cir. 1991); accord *Autogiro Co. of Am. v. United States*, 181 Cl. Cl. 55, 384 F.2d 391, 396-98, 155 U.S.P.Q. (BNA) 697, 701-03 (Cl. Cl. 1967). "Expert testimony, including evidence of how those skilled in the art would interpret the claims, may also be used." *Fonar Corp. v. Johnson & Johnson*, 821 F.2d 627, 631 (Fed. Cir. 1987). In construing the claims in this case, all these sources, as well as extrinsic evidence in the form of Westview's sales literature, were included in the record of the trial court proceedings.

Claims must be read in view of the specification, [**36] of which they are a part. *Autogiro*, 384 F.2d at 397, 155 U.S.P.Q. (BNA) at 702; see *Wimans v. Denmead*, 56 U.S. (15 How.) at 338; *Bates v. Coe*, 98 U.S. at 38-39. The specification contains a written description of the invention that must enable one of ordinary skill in the art to make and use the invention. For claim construction purposes, the description may act as a sort of dictionary, which explains the invention and may define terms used in the claims. See *In re Vogel*, 57 C.C.P.1. 920, 422 F.2d 438, 441, 164 U.S.P.Q. (BNA) 619, 621 (CCPA 1970) ("Occasionally the disclosure will serve as a dictionary for terms appearing [*980] in the claims, and in such instances the disclosure may be used in interpreting the coverage of the claim."). As we have often stated, a patentee is free to be his own lexicographer. *Autogiro*, 384 F.2d at 397, 155 U.S.P.Q. (BNA) at 702. The caveat is that any special definition given to a word must be

clearly defined in the specification. *Intellicall, Inc. v. Phonometrics, Inc.*, 952 F.2d 1384, 1388, 21 U.S.P.Q.2D (BNA) 1383, 1386 (Fed. Cir. 1992). The written description part of the specification itself does not delimit the right to exclude. That is the function and purpose of claims.

To construe [**37] claim language, the court should also consider the patent's prosecution history, if it is in evidence. *Graham v. John Deere Co.*, 383 U.S. 1, 33, 148 U.S.P.Q. (BNA) 459, 473, 15 L. Ed. 2d 545, 86 S. Ct. 684 (1966). This "undisputed public record" of proceedings in the Patent and Trademark Office is of primary significance in understanding the claims. See *Autogiro*, 384 F.2d at 397, 155 U.S.P.Q. (BNA) at 702 (the "file wrapper" is "part[] of the patent"). The court has broad power to look as a matter of law to the prosecution history of the patent in order to ascertain the true meaning of language used in the patent claims:

The construction of the patent is confirmed by the avowed understanding of the patentee, expressed by him, or on his half [sic], when his application for the original patent was pending. . . . When a patent bears on its face a particular construction, inasmuch as the specification and claim are in the words of the patentee, . . . such a construction may be confirmed by what the patentee said when he was making his application.

Goodyear Dental Vulcanite Co. v. Davis, 102 U.S. 222, 227, 26 L. Ed. 149 (1880); see *Singer Mfg. Co.*, 192 U.S. at 278-85 (construing the claims in light of the prosecution [**38] history as a matter of law).¹⁰ Although the prosecution history can and should be used to understand the language used in the claims, it too cannot "enlarge, diminish, or vary" the limitations in the claims. *Goodyear Dental Vulcanite Co.*, 102 U.S. at 227; *Intervet Am., Inc. v. Kee-Vet Labs., Inc.*, 887 F.2d 1050, 1054, 12 U.S.P.Q.2D (BNA) 1474, 1477 (Fed. Cir. 1989).

10 Accord *SRI Int'l v. Matsushita Elec. Corp.*, 775 F.2d 1107, 1120, 227 U.S.P.Q. (BNA) 577, 585 (Fed. Cir. 1985) (in banc) ("the district court's construction of the claims in light of the prosecution history [is] a question of law"); *Lemelson v. United States*, 752 F.2d 1538, 1550, 1552, 224 U.S.P.Q. (BNA) 526, 533 (Fed. Cir.

1985) ("The prosecution histories being admitted into evidence, the court should have considered them in its construction of the claims."); *Molecular Research Corp. v. CBS, Inc.*, 793 F.2d 1261, 1270, 229 U.S.P.Q. (BNA) 805, 811 (Fed. Cir. 1986) ("The prosecution history can and should, where relevant, be assessed (along with, e.g., claim language and specification) in properly interpreting claim language."); *Mannesmann Demag Corp. v. Engineered Metal Prods. Co.*, 793 F.2d 1279, 1283, 230 U.S.P.Q. (BNA) 45, 47 (Fed. Cir. 1986) ("In view of the prosecution history the district court correctly interpreted the literal meaning of" the claim language at issue); 6 Ernest B. Lipscomb III, Walker on Patents § 21:1, at 261 (3d ed. 1987) ("The words of a patent or patent application, like the words of specific claims therein, always raise a question of law for the court . . .").

[**39] Extrinsic evidence consists of all evidence external to the patent and prosecution history, including expert and inventor testimony, dictionaries, and learned treatises. This evidence may be helpful to explain scientific principles, the meaning of technical terms, and terms of art that appear in the patent and prosecution history. Extrinsic evidence may demonstrate the state of the prior art at the time of the invention. It is useful "to show what was then old, to distinguish what was new, and to aid the court in the construction of the patent." *Brown v. Piper*, 91 U.S. 37, 41, 23 L. Ed. 200 (1875).

The court may, in its discretion, receive extrinsic evidence in order "to aid the court in coming to a correct conclusion" as to the "true meaning of the language employed" in the patent. *Seymour v. Osborne*, 78 U.S. (11 Wall.) 516, 546, 20 L. Ed. 33 (1871) (reviewing a decree in equity); see *United Carbon Co. v. Binney & Smith Co.*, 317 U.S. 228, 233, 55 U.S.P.Q. (BNA) 381, 384, 87 L. Ed. 232, 63 S. Ct. 165 (1942) (the court construed the claim by relying in part on the testimony of one of the patentees as the "clearest exposition of the significance which the terms employed in the claims had for those skilled in the art"); [**981] *U.S. Indus.* [**40] *Chems., Inc. v. Carbide & Carbon Chems. Corp.*, 315 U.S. 668, 678, 53 U.S.P.Q. (BNA) 6, 10, 86 L. Ed. 1105, 62 S. Ct. 839 (1942) ("It is permissible, and often necessary, to receive expert evidence to ascertain the meaning of a technical or scientific term or term of art so that the court may be aided in understanding . . . what

[the instruments] actually say."); *Winans v. New York & Erie R.R. Co.*, 62 U.S. (21 How.) at 101 ("Professors or mechanics cannot be received to prove to the court or jury what is the proper or legal construction of any instrument of writing. A judge may obtain information from them, if he desire it, on matters which he does not clearly comprehend, but cannot be compelled to receive their opinions as matter of evidence."); *Marsh v. Quick-Meal Stove Co.*, 51 F. 203 (U.C.D. Mo. 1892) ("It is the province of the court to construe the claims of the patent that has been offered in evidence. That construction, of course, is to be made in the light of such expert testimony as has been offered."); 3 Robinson on Patents, supra, §§ 1012-15, 1019-20; accord *Seattle Box Co. v. Industrial Crating & Packing, Inc.*, 731 F.2d 818, 826, 221 U.S.P.Q. (BNA) 568, 573 (Fed. Cir. 1984) ("A trial judge has sole [*41] discretion to decide whether or not he needs, or even just desires, an expert's assistance to understand a patent. We will not disturb that discretionary decision except in the clearest case."); *Advanced Cardiovascular Sys., Inc. v. Scimed Life Sys., Inc.*, 887 F.2d 1070, 1076, 12 U.S.P.Q.2D (BNA) 1539, 1544 (Fed. Cir. 1989) (Newman, J. dissenting) ("The purpose of expert testimony is to provide assistance to the court in understanding, when the claims are technologically complex or linguistically obscure, how a technician in the field, reading the patent, would understand the claims.") (emphasis added).

Extrinsic evidence is to be used for the court's understanding of the patent, not for the purpose of varying or contradicting the terms of the claims. *U.S. Indus. Chems., Inc.*, 315 U.S. at 678, 53 U.S.P.Q. (BNA) at 10; *Catalin Corp. of Am. v. Catalazuli Mfg. Co.*, 79 F.2d 593, 594, 27 U.S.P.Q. (BNA) 371, 373 (2d Cir. 1935) (Learned Hand, J.) ("If the doctrine of the 'integration' of a written instrument has any basis at all, surely it should apply to such a document . . . [as the patent]."); 3 Robinson on Patents, supra, § 1019, at 247-48. When, after considering the extrinsic evidence, [*42] the court finally arrives at an understanding of the language as used in the patent and prosecution history, the court must then pronounce as a matter of law the meaning of that language. See *Loom Co. v. Higgins*, 105 U.S. 580 at 586, 26 L. Ed. 1177. This ordinarily can be accomplished by the court in framing its charge to the jury, but may also be done in the context of dispositive motions such as those seeking judgment as a matter of law.

Through this process of construing claims by, among other things, using certain extrinsic evidence that the court finds helpful and rejecting other evidence as unhelpful, and resolving disputes en route to pronouncing the meaning of claim language as a matter of law based on the patent documents themselves, the court is not crediting certain evidence over other evidence or making factual evidentiary findings. Rather, the court is looking to the extrinsic evidence to assist in its construction of the written document, a task it is required to perform.¹¹ The district court's claim construction, enlightened by such extrinsic evidence as may be helpful, is still based upon the patent and prosecution history. It is therefore still construction, and is a matter [*43] of law subject to de novo review.

11 For an example of very thorough appellate review of claim construction based on the patent in view of extrinsic evidence, see *Mitchell v. Tilghman*, 86 U.S. (19 Wall.) 287, 379-90, 22 L. Ed. 125 (1874).

B. Applying this analysis of claim construction, we conclude that (1) the trial court did not abuse its discretion when it admitted the extrinsic evidence offered by Markman -- Markman's testimony and the testimony of Markman's "patent expert" -- on the issue of claim construction, and that (2) the trial court properly rejected this extrinsic evidence to the extent it contradicted the court's construction of the claims based on the specification and prosecution history. Although in this case the trial court might have granted Westview's motion for directed verdict and should have instructed the jury [*982] as to the meaning of the claims (including the disputed term "inventory"), its failure to do so was rendered harmless by the court's subsequent response to Westview's post-trial motion.

[*44] We agree with the trial court that the term "inventory" refers, at least in part, to articles of clothing, contrary to Markman's contention that "inventory" may be limited to just cash or inventory receipts. As the district court noted, the claim phrase "detect and localize spurious additions to inventory as well as spurious deletions therefrom" does not make sense using Markman's definition of "inventory." Dollars or invoice totals are not "localized" since dollars do not travel through the cleaning process and the location of invoices is irrelevant. Location is relevant to clothing, since it moves through and sometimes without the establishment,

where it can be lost, stolen, or damaged. Also, "spurious" additions and deletions logically relate to clothing because "dollars" would not be spuriously added to a dry-cleaner's inventory. Thus, the language of the claim itself suggests the conclusion that the dry-cleaner's "inventory" includes clothing.

The patent specification confirms this. The specification is pervasive in using the term "inventory" to consist of "articles of clothing." Rather than set forth each instance, we refer the reader to a few examples:

This invention [**45] relates to inventory control devices capable of monitoring and reporting upon the status, location and throughput of inventory in an establishment. [Col. 1, lines 12-17.]

The best inventory control and management reporting information systems has [sic] the ability to determine and report the current location of any given article^[12] in inventory. [Col. 5, lines 14-17.]

12 It is undisputed that "article" means "article of clothing."

Every transaction is recorded, including identification of the articles placed in inventory. [Col. 5, lines 8-10.]

Incoming articles to be placed in inventory are accumulated over a counter . . . [Col. 6, lines 7-8.]

Articles to be cleaned are associated with a unique bar code indicia for later automatic or semiautomatic optical scanning and data input, whereby the progress of articles through the laundry and drycleaning systems can be completely monitored. [Col. 2, lines 53-57.]

The prosecution history [**46] is also in accord. During prosecution of the original patent application in this case,

Markman amended claim 1 in order to overcome an obviousness rejection by adding limitations reciting among other things "whereby said system can detect and localize spurious additions to inventory as well as spurious deletions therefrom." Markman argued in his remarks to the examiner that

unlike the usual system in which apparatus generates non-unique indicia (e.g., Stewart's price indicia) and/or indicia that is [sic] not produced concurrently with the commencement of a transaction (e.g., pre-printed tags), applicant's system is operable to keep a running reconcilable inventory total by adding input articles and subtracting output articles, and also protects against the possibility of undocumented or spuriously-documented articles entering the system. [Emphasis in original.]

Markman also referred the examiner to "features present" in claim 1, explaining:

Means are also provided for reconciling the very same unique and concurrently-generated indicia at later points during processing whereby the entry or exit of inventory articles in irregular ways can be localized. [**47]

Also, the prosecution history of the patent on reissue conflicts with Markman's argument now that claim 1 does not require "tracking" of articles of clothing. In order to obtain other claims in the reissue patent broader than claim 1, which was carried through to the reissue patent, Markman explained the scope of the original claims thusly:

1. Tracking of Individual Articles

It may be argued that the claims are limited to a system that tracks individual articles such as individual pieces of clothing brought by a single consumer to a [**983] drycleaning establishment or the like. I believe that tracking of a transaction whether it involves one article or several is properly disclosed and allowable. The claim language recites entry of "descriptions of each of said articles associated with the transactions". This passage is more limited than I had a right

to claim because, although individual articles, e.g. a pair of pants, could be accounted for by individual marking, scanning and reconciliation in reports, the grouping of such articles into sets for tracking (e.g., a suit comprising pants under jacket and/or a suit and a Dress or other separable [sic] articles [*48] grouped together) is reasonably disclosed as forming part of the invention and is allowable over the prior art.

It is evident from Markman's explanation of the claims to the examiner that he used "inventory" in the patent and the examiner understood "inventory" to consist of "articles of clothing." The prosecution history thus confirms the meaning of "inventory" as including "articles of clothing."

Markman argues that the extrinsic evidence of record provides substantial evidence in support of the jury's and his claim construction. Markman testified as an inventor of the patent in suit and as one of ordinary skill in the art (or, perhaps more accurately, one of "extraordinary" skill in the art) that "inventory" did not need to include articles of clothing. Markman's "patent expert" testified likewise, when giving his opinion on the proper construction of the claims. Finally, Markman argues that the testimony of Westview's president and some of its sales literature also support such claim construction. We do not find Markman's arguments persuasive.

First, the testimony of Markman and his patent attorney on the proper construction of the claims is entitled to no deference. [*49] For example, they both testified as to how the patent should be construed based on the text of the patent. This testimony about construction, however, amounts to no more than legal opinion -- it is precisely the process of construction that the court must undertake. Thus, as to these types of opinions, the court has complete discretion to adopt the expert legal opinion as its own, to find guidance from it, or to ignore it entirely, or even to exclude it. See *Becton Dickinson & Co. v. C.R. Bard, Inc.*, 922 F.2d 792, 797, 17 U.S.P.Q.2D (BNA) 1097, 1100 (Fed. Cir. 1990). When legal "experts" offer their conflicting views of how the patent should be construed, or where the legal expert's view of how the patent should be construed conflicts with the patent document itself, such conflict does not create a question of fact nor can the expert opinion bind the court

or relieve the court of its obligation to construe the claims according to the tenor of the patent. This opinion testimony also does not change or affect the *de novo* appellate review standard for ascertaining the meaning of the claim language. Thus, to the extent they were testifying about construction itself, we reject Markman's and [*50] Markman's patent expert's testimony as having any controlling effect on what the court below and we perceive to be the meaning of "inventory" as used in the patent and prosecution history.

Second, the extrinsic evidence of record cannot be relied on to change the meaning of the claims. In this case, as fully discussed above, the patent and prosecution history make clear that "inventory" in claim 1 includes in its meaning "articles of clothing." The district court exercised its discretion in finding unhelpful Markman's testimony that he meant "inventory," or that one of ordinary skill in the art would understand "inventory," to mean something to the contrary, and furthermore the district court rejected the testimony as conflicting with the meaning derived from the patent and prosecution history. In our construction of the claim term "inventory," we too find unhelpful and reject Markman's testimony. Similarly, even if they in fact used "inventory" to mean other than articles of clothing, Westview's sales literature and the testimony of its president do not dissuade us from our legal construction of the claim, based on the patent and prosecution history, that the claim term "inventory" [*51] means articles of clothing.

V.

A. This decision that claim construction is properly viewed solely as a question [*984] of law is consistent with precedent of the Supreme Court and much of this court's precedent. Yet the dissenting and one of the concurring opinions assert that our decision violates the *Seventh Amendment*. A close analysis of the bases underlying their arguments reveals, however, that they are unsupported by logic and precedent.

The *Seventh Amendment* provides "in suits at common law, where the value in controversy shall exceed twenty dollars, the right of trial by jury shall be preserved." *U.S. Const. amend. VII*. Thus, if an action could be tried to a jury in 1791, the right to a jury trial is preserved. The *Seventh Amendment* has also been judicially interpreted as extending the right to jury trial to statutory causes of action analogous to common law actions. *Tull v. United States*, 481 U.S. 412, 417, 95 L.

Ed. 2d 365, 107 S. Ct. 1831 (1987).

The dissenting and one of the concurring opinions express in somewhat different ways why they believe our holding deprives plaintiffs of the constitutional right to a jury trial in patent infringement cases. The dissenting opinion argues there are jury triable [^{**52}] factual inquiries involved in determining the scope of a claim and this determination is part of and often dispositive of patent infringement questions. One concurring opinion, which apparently acknowledges that sometimes claim construction is a legal question for the court, nonetheless finds a majority effort to indirectly create a "complexity exception" to the right to jury trial in patent infringement cases that will allow a three judge panel of this court to "do pretty much what it wants under its de novo retrial."

These arguments do not ring true. In this opinion we do not deprive parties of their right to a jury trial in patent infringement cases. Our opinion merely holds that part of the infringement inquiry, construing and determining the scope of the claims in a patent, is strictly a legal question for the court.¹³ The patentee's right to a jury trial on the application of the properly construed claim to the accused device is preserved as it was in 1791.

13 Our opinion also holds that we review district court determinations on questions of claim construction under a de novo standard of review, like other legal questions. In this regard, we emphasize that we are reiterating the long-recognized appellate review standard for issues of law in the trial proceeding, regardless of whether the case was tried to a judge or a jury. Contrary to the contentions of the dissenting opinion, this does not "effect[] a dramatic realignment of jury, judge, and the appellate process."

[^{**53}] Any constitutional concerns raised by this opinion must be limited to the issue of claim construction. It is significant that neither the dissenting nor the concurring opinions cite any cases supporting the proposition that claim construction was a question of fact or involved triable issues of fact to a jury in or prior to 1791. None of the briefs of the parties or amici cite such a case, nor have we found any. The search for such a case may well be a fruitless one because of the manifest differences in patent law in eighteenth century England and patent law as it exists today in Title 35 of the United States Code. See *Hogg*, 47 U.S. (6 How.) at 479-83

(citing the significant differences between English law and United States law and cautioning against reliance on the former when applying the latter); Emerson Stringham, Outline of Patent Law § 5000, at 266-67 (1937) ("The patent claim, first developed in the United States, is now largely relied upon as defining the scope of protections . . .") (emphasis added). See generally, P.J. Federico, Origin and Early History of Patents, 11 J. Pat. Off. Soc'y 292 (1929).

B. The dissenting and one of the concurring opinions [^{**54}] attempt to make the case that construing claims is analogous to construing and interpreting contracts, deeds, and wills. Traditionally courts have treated the construction of these documents as being a legal question for the court, but have stated that under certain circumstances the interpretation of an agreement may raise jury triable questions. Thus, by analogy, the argument is made that although claim construction may indeed be a question of law for the court, it also involves (or, in the argument of the concurrence, may involve) triable issues of fact.

The analogy of a patent to a contract may appear to some extent to be an appropriate [^{**85}] way of describing the circumstances surrounding the issuance of a patent.¹⁴ The inventor is required to make full disclosure of his invention to the Patent and Trademark Office (PTO) and to the public in his patent specification, which he is otherwise not obligated to do. In return, the law allows the government to confer a property right to exclude anyone else from making, using, or selling the invention covered by the claims for seventeen years, which it is otherwise not obligated to do.

14 A patent, however, is not a contract. Contracts are executory in nature -- they contain promises that must be performed. See E. Allan Farnsworth, Contracts § 1.1, at 3-4 (2d ed. 1990). Once a patent is issued, any purported exchange of promises between the applicant and the Patent and Trademark Office (PTO) has been fully executed. A patent is a statutory grant of the right to exclude others from making, using, or selling the invention recited in the claims, read in light of the specification. 35 U.S.C. § 154. There is no discretion on the part of the PTO as to whether or not to grant the patent -- if the statutory requirements are met, a patent is issued. 35 U.S.C. § 151. Likewise, the other party to the

transaction, the patentee, cannot "contract" with any one other than the federal government to receive a right to exclude others from making, using, or selling his invention. See *Bonito Boats, Inc. v. Thunder Craft Boats, Inc.*, 489 U.S. 141, 162, 103 L. Ed. 2d 118, 109 S. Ct. 971 (1989).

[**55] The analogy of a patent to a contract is not useful, however, in the context of a patent infringement suit. Patents are not contracts per se and patent infringement actions have never been viewed as breach of contract actions. Patent infringement has often been described as a tort. In a patent infringement suit, the inventor sues a competitor for infringing upon his right to exclude. The competitor is never a party to the so-called "contract" between the government and the inventor. See *Keystone*, 95 U.S. at 279 ("As patents are procured ex parte, the public is not bound by them, but the patentees are."). Nor does the competitor ever breach this contract between the government and the inventor by making, using, or selling the accused devices.

Questions of fact may arise in construing contracts, deeds, or wills in two contexts. First, the document may not reflect the agreement between, or the intent of, the two parties. Thus, unless the document is fully integrated and the parol evidence rule (or its equivalent in the other areas of law) applies, extrinsic evidence may be offered to demonstrate different or additional terms. There is no parol evidence rule in patent law for [**56] obvious reasons. It is axiomatic that the invention protected by the patent must be covered by the claims, otherwise it is lost. *Motion Picture Patents Co. v. Universal Film Mfg. Co.*, 243 U.S. 502, 510, 61 L. Ed. 871, 37 S. Ct. 416 (1917). Parol or other extrinsic evidence cannot add, subtract, or vary the limitations of the claims.

A question of fact may also arise in construing contracts, deeds, or wills when there is an ambiguous term. In this situation, the parol evidence rule does not apply and extrinsic evidence may be offered to demonstrate what the parties intended when they used the term. Thus the factual inquiry for the jury in these cases focuses on the subjective intent of the parties when they entered into the agreement.

No inquiry as to the subjective intent of the applicant or PTO is appropriate or even possible in the context of a patent infringement suit. The subjective intent of the inventor when he used a particular term is of little or no probative weight in determining the scope of a claim

(except as documented in the prosecution history). See *Senmed*, 888 F.2d at 817, n.8, 12 U.S.P.Q.2D (BNA) at 1512 n.8. In fact, commonly the claims are drafted by the inventor's patent solicitor and they [**57] may even be drafted by the patent examiner in an examiner's amendment (subject to the approval of the inventor's solicitor). See Manual of Patent Examining Procedure (MPEP) § 1302.04 (Rev. 15, Aug. 1993) ("Examiner's Amendments and Changes"). While presumably the inventor has approved any changes to the claim scope that have occurred via amendment during the prosecution process, it is not unusual for there to be a significant difference between what an inventor thinks his patented invention is and what the ultimate scope of the claims is after allowance by the PTO. See generally *Senmed*, 888 F.2d at 819 n.8, 12 U.S.P.Q.2D (BNA) at 1521 n.8. Of course the views of the other party to the "patent contract," the government, are generally not [**986] obtainable, except as reflected in the prosecution history. See *Western Elec. Co. v. Piezo Tech., Inc.*, 860 F.2d 428, 432-33, 8 U.S.P.Q.2D (BNA) 1853, 1856-57 (Fed. Cir. 1988); MPEP § 1701.01 ("Office personnel not to testify").

Thus the focus in construing disputed terms in claim language is not the subjective intent of the parties to the patent contract when they used a particular term. Rather the focus is on the objective test of what one of ordinary [**58] skill in the art at the time of the invention would have understood the term to mean.

Moreover, ideally there should be no "ambiguity" in claim language to one of ordinary skill in the art that would require resort to evidence outside the specification and prosecution history. Section 112 of Title 35 requires that specifications "contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same . . ." and requires that the specification "shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention." 35 U.S.C. § 112 (emphasis added). This statutory language has as its purpose the avoidance of the kind of ambiguity that allows introduction of extrinsic evidence in the contract law analogy. See, e.g., *Keystone*, 95 U.S. at 278 ("When the terms of a claim in a patent are clear and distinct (as they always should be), the patentee, in a suit brought

upon the patent, is [*59] bound by it.") (emphasis added). Patent applications, unlike contracts, are reviewed by patent examiners, quasi-judicial officials trained in the law and presumed to "have some expertise in interpreting the [prior art] references and to be familiar from their work with the level of skill in the art and whose duty it is to issue only valid patents." *American Hoist & Derrick Co. v. Sowa & Sons, Inc.*, 725 F.2d 1350, 1359, 220 U.S.P.Q. (BNA) 763, 770 (Fed. Cir. 1984). See also *Western Electric*, 860 F.2d at 431, 8 U.S.P.Q.2D (BNA) at 1857. If the patent's claims are sufficiently unambiguous for the PTO, there should exist no factual ambiguity when those same claims are later construed by a court of law in an infringement action. See *Intervec Am.*, 882 F.2d at 1053, 12 U.S.P.Q.2D (BNA) at 1476 ("Ambiguity, undue breadth, vagueness, and triviality are matters that go to claim validity for failure to comply with 35 U.S.C. § 112-P 2, not to interpretation or construction.") (emphasis in original).

This does not mean there is never a need for extrinsic evidence in a patent infringement suit. A judge is not usually a person conversant in the particular technical art involved and is not the hypothetical [*60] person skilled in the art to whom a patent is addressed. Extrinsic evidence, therefore, may be necessary to inform the court about the language in which the patent is written. But this evidence is not for the purpose of clarifying ambiguity in claim terminology. It is not ambiguity in the document that creates the need for extrinsic evidence but rather unfamiliarity of the court with the terminology of the art to which the patent is addressed.

Accordingly, the contract, deed, and will cases relied upon in the dissenting and concurring opinions serve only to highlight the differences between claim construction in a patent infringement case and contract interpretation in a breach of contract suit or construction/interpretation of a will in a will contest. They reflect the court's concern with finding the "true" intention of the parties to an agreement, deed, or will. ¹⁵ This [*987] sort of inquiry is not appropriate, or even possible, in the context of patent litigation. Infringement litigation may involve multiple actions against different defendants none of whom has any personal knowledge of or participation in the PTO proceedings where the give and take that results in the negotiated claim [*61] language occurs. Thus there can be no search for the defendant party's intent.

15 Illustrative of the search for the intent of the

parties or the makers are the following opinions cited in the dissenting and concurring opinions. *Goddard v. Foster*, 84 U.S. (17 Wall.) 123, 142-43, 21 L. Ed. 589 (1873) (in a contract between two parties, courts "are not denied the same light and information the parties enjoyed when the contract was executed, but they may acquaint themselves with the persons and circumstances that are the subjects of the statements in the written agreement"); *Brown & Co. v. McGraw*, 39 U.S. (14 Pet.) 479, 493, 10 L. Ed. 550 (1840) ("The true interpretation of the language may be left to the consideration of the jury for the purpose of carrying into effect the real intention of the parties."); *Startex Drilling Co. v. Sohio Petroleum Co.*, 680 F.2d 412, 415 (5th Cir. 1982) (submitting case to jury "to determine what the parties meant" by ambiguous terms in the contract); *In re Union Trust Co.*, 89 Misc. 69, 151 N.Y.S. 246, 249 (Sur. Ct.) ("The first and cardinal rule of interpretation of wills is the application of the meaning of the testator, not the meaning of the adjudications."), modified, 170 A.D. 176, 156 N.Y.S. 32 (1915); see also *Reed v. Proprietors of Locks & Canals on Merrimac River*, 49 U.S. (8 How.) 274, 288, 12 L. Ed. 1077 (1850) ("Whereas the intention of the parties is to be found in their deed alone, which it is the duty of the court to construe.").

[**62] C. The more appropriate analogy for interpreting patent claims is the statutory interpretation analogy. Statutory interpretation is a matter of law strictly for the court. There can be only one correct interpretation of a statute that applies to all persons. Statutes are written instruments that all persons are presumed to be aware of and are bound to follow. Statutes, like patents, are enforceable against the public, unlike private agreements between contracting parties. When interpreting statutes, a court looks to the language of the statute and construes it according to the traditional tools of statutory construction, including certain well known canons of construction. *United States v. John C. Grimberg Co.*, 702 F.2d 1362, 1365, 1368 (Fed. Cir. 1983). A court may also find it necessary to review the legislative history of the statute, which is itself a matter of public record, just as the specification and prosecution history of a patent are public records. *Id.* at 1369. While a court may seek from the public record to ascertain the collective intent of Congress when it interprets a statute, the subjective intent

of any particular person involved in the legislative process [*63] is not determinative. Thus the members of Congress, or staffpersons who draft legislation, are not deposed or called on to testify in actions involving statutory interpretation. Similarly, the subjective meaning that a patentee may ascribe to claim language is also not determinative. Thus, it is from the public record that a court should seek in a patent infringement case to find the meaning of claim language.

There are, of course, differences between a statute and a patent. But because both of these public instruments may create liability in third persons who were not participants in the legislative process or the PTO proceedings, as the case may be, we conclude that the statutory interpretation model is a more accurate model than the contractual one for purposes of determining whether constitutional protections are transgressed by assigning claim construction exclusively to judges.

D. The dissenting opinion and one of the concurring opinions, along with Markman and certain of the amici, contend that assigning claim construction exclusively to judges is in conflict with certain decisions of the Supreme Court. We are not persuaded. The dissenting and concurring opinions place [*64] heavy reliance on two Supreme Court cases, *Silsby v. Foote*, 55 U.S. (14 How.) 218, 14 L. Ed. 394 (1852), and *Bischoff v. Wethered*, 76 U.S. (9 Wall.) 812, 19 L. Ed. 829 (1869), for the proposition that questions of fact may arise in the determination of the scope of a patent claim. A close examination of these cases, however, reveals they do not support that argument.¹⁶

16 One concurring opinion also relies on *Winans v. Denmead*, 56 U.S. (15 How.) 330, 14 L. Ed. 717 (1853), as a case where the court "construed" the claim in a general manner and left it for the jury to fill in specifics. As correctly noted by the dissent, this case is more properly understood as one involving the doctrine of equivalents infringement notwithstanding the literal language of the claims.

In *Silsby v. Foote*, the Court affirmed a trial judge who left the question of what elements were "essential" for the claimed invention to the jury. According to the Court, the claim in that case stated: "I also claim the combination, above described, by which the regulation [*65] of the heat of the stove, or other structure in which it may be used, is effected." *Id.* at 226. The Court

agreed with the petitioner that "the construction of the claim was undoubtedly for the court." *Id.* at 225. The Court continued, however, that "when a claim does not point out and designate the particular elements [*988] which compose a combination, but only declares, as it properly may, that the combination is made up of so much of the described machinery as effects a particular result, it is a question of fact which of the described parts are essential to produce that result." *Id.* at 226. Thus the Court concluded that where a combination claim does not point out the elements of the claim but rather describes "machinery as effects a particular result," the jury may determine "which of the described parts are essential to produce that result." Otherwise, the question of claim scope belonged to the court.

It is difficult to see how *Silsby* supports the views set forth in the dissenting and concurring opinions. This is especially so because applicants are now required by 35 U.S.C. § 112 to particularly point out and distinctly claim the subject matter the applicant regards [*66] as his invention and this requirement applies with equal force to claims having means-plus-function limitations. The only jury-triable issue described in *Silsby* on the question of claim scope is now statutorily foreclosed. Further, a jury is not allowed to canvass the patent specification to evaluate what portions of a combination claim are "essential" to produce a particular result. See *Keystone*, 95 U.S. at 278 ("This provision [the predecessor to section 112, para. 2] was inserted in the law for the purpose of relieving the courts from the duty of ascertaining the exact invention of the patentee by inference and conjecture, derived from a laborious examination of the previous inventions, and a comparison thereof with that claimed by him."). Both this court and the Supreme Court have made clear that all elements of a patent claim are material, with no single part of a claim being more important or "essential" than another. See *Fay v. Cordesman*, 109 U.S. 408, 420-21, 27 L. Ed. 979, 3 S. Ct. 236 (1883); *Pennwalt Corp. v. Durand-Wayland Inc.*, 833 F.2d 931, 936, 4 U.S.P.Q.2D (BNA) 1737, 1741 (Fed. Cir. 1987) (in banc).

The reliance on *Bischoff v. Wethered* is even more puzzling. *Bischoff* did not [*67] even involve an infringement issue but rather involved a question of invalidity in a breach of contract action. The plaintiff, who sought to invalidate the patent on the basis of a prior art patent, argued that the court, and not the jury, should have decided the question of "identity or diversity of the

inventions." *Bischoff*, 76 U.S. at 816. The Court disagreed. While the Court again acknowledged that "construction of written instruments is the province of the court alone," it concluded that in this case "it is not the construction of the instrument, but the character of the thing invented, which is sought in questions of identity and diversity of inventions." *Id.* at 816.

Markman's case does not involve a question of identity or diversity of inventions. The word "claim" does not even appear in the *Bischoff* case. Rather *Bischoff* is concerned with divining the "character of the thing invented" from the patent in suit and the prior art patent. It is difficult, if not impossible, to discern any legal principle from *Bischoff* that relates to claim construction in the context of patent infringement. To the extent the dissenting and concurring opinions view [**68] claim construction in an infringement case as a search for the "character" of the thing invented, we disagree.

Finally, the concurring opinions consider that much of our opinion is dictum because there is no "genuine" dispute as to the claim term "inventory." As we have demonstrated, Markman squarely raised the issue of whether the court acted within its power in granting JMOL after the jury had construed the claims. The trial court viewed claim construction as a legal question and determined that it could decide the meaning of the term "inventory" as a matter of law based on the patent document and prosecution history. Markman, on the other hand, viewed the construction of the claim as one of fact with the jury verdict being supported by the evidence.

CONCLUSION

Correctly reasoning that claim construction is a matter of law for the court, the district court properly rejected the jury's verdict and granted JMOL. Upon our de novo review of the court's construction of the claim language, we agree that "inventory" in claim 1 includes within its meaning "articles of clothing." It is undisputed that Westview's [**989] device does not and cannot track articles of clothing. Accordingly, [**69] there is no substantial evidence to support the jury's finding of infringement of claims 1 and 10 of *United States Reissue Patent No. 33,054* when those claims are correctly construed. The district court's grant of judgment of noninfringement as a matter of law is

AFFIRMED.

CONCUR BY: MAYER; RADER

CONCUR

MAYER, Circuit Judge, concurring in the judgment.

Today the court jettisons more than two hundred years of jurisprudence and eviscerates the role of the jury preserved by the *Seventh Amendment of the Constitution of the United States*; it marks a sea change in the course of patent law that is nothing short of bizarre. Sadly, this decision represents a secession from the mainstream of the law. It portends turbulence and cynicism in patent litigation. For this is not just about claim language, it is about ejecting juries from infringement cases. All these pages and all these words cannot camouflage what the court well knows: to decide what the claims mean is nearly always to decide the case. But today's action is of a piece with a broader bid afoot to essentially banish juries from patent cases altogether. If it succeeds juries will be relegated, in those few cases where they [**70] have any presence at all, to rubber stamps, their verdicts preordained by "legal" and "equitable" determinations that brook only one "reasonable" result. Indeed, this movement would vest authority over patent disputes in legislative courts, unconstrained by Article III and the *Seventh Amendment*. See *In re Lockwood*, Misc. Docket No. 394, slip op. at 6 (Fed. Cir. filed Feb. 7, 1995) (opinion dissenting from order denying rehearing in banc) ("A constitutional jury right to determine validity of a patent does not attach to this public grant. Congress could place the issue of validity entirely in the hands of an Article I trial court with particular expertise if it chose to do so."). Declaring that the jury is a "black box" incapable of a "reasoned decision", several judges of the court have already advised that they are aboard this campaign. *Id.*, slip op. at 20-21. The quest to free patent litigation from the "unpredictability" of jury verdicts, and generalist judges, results from insular dogmatism inspired by unwarrantable elitism; it is unconstitutional.

The question is whether the interpretation of patent claims is a purely legal exercise -- always decided by the judge as [**71] a matter of law and never raising a question of fact -- or rather a mixed question of law and fact, in which some factual matters might need to be resolved by the factfinder on the way to construing the claims as a matter of law. The answer is critical to how questions of claim interpretation are decided at the trial level and how we review them on appeal.

The ultimate issue of patent scope, depending as it does on the legal effect of the words of the claims, is a question of law. But it does not necessarily follow that the judge is to decide every question that arises during the course of claim construction as a matter of law. Cf. *Graham v. John Deere Co.*, 383 U.S. 1, 17, 15 L. Ed. 2d 545, 86 S. Ct. 684 (1966) (obviousness is a legal conclusion with underlying factual determinations).¹ Instead, characterization of claim construction as "legal" begs the questions whether fact issues may arise subsidiary to the ultimate legal conclusion, how such issues are to be decided, and by whom.

1 While the ultimate question of patent validity is one of law, *Graham v. John Deere Co.*, 383 U.S. 1, 17, 15 L. Ed. 2d 545, 86 S. Ct. 684 (1966), there are a number of underlying inquiries that raise questions of fact. In addition to obviousness, these include anticipation, *Atlas Powder Co. v. E.I. DuPont de Nemours & Co.*, 750 F.2d 1569, 1573, 224 U.S.P.Q. (BNA) 409, 411 (Fed. Cir. 1985), prior public use or sale, *U.S. Envtl. Prods., Inc. v. Westall*, 911 F.2d 713, 715, 15 U.S.P.Q.2D (BNA) 1898, 1900 (Fed. Cir. 1990) (a legal conclusion supported by underlying facts), and sufficiency of a specification's disclosure. *Uter v. Hiroga*, 845 F.2d 993, 998, 6 U.S.P.Q.2D (BNA) 1709, 1714 (Fed. Cir. 1988) (same).

[**72] Contrary to what it says today, this court (including the judges in the majority) has always held that claim interpretation is a matter of law depending on underlying factual inquiries. See, e.g., *Arachnid Inc. v. Medalist Mktg. Corp.*, 972 F.2d 1300, 1302, 23 [*990] U.S.P.Q.2D (BNA) 1946, 1948 (Fed. Cir. 1992) (though claim construction is issue of law for the court, it "may require the factfinder to resolve certain factual issues such as what occurred during the prosecution history"); *Lemelson v. General Mills Inc.*, 968 F.2d 1202, 1206, 23 U.S.P.Q.2D (BNA) 1284, 1288 (Fed. Cir. 1992) (same, noting that "underlying factual issues in dispute become the jury's province to resolve in the course of rendering its verdict on infringement"); *Johnston v. IFAC Corp.*, 885 F.2d 1574, 1579, 12 U.S.P.Q.2D (BNA) 1382, 1386 (Fed. Cir. 1989) ("A disputed issue of fact may, of course, arise in connection with interpretation of a term in a claim if there is a genuine evidentiary conflict created by the underlying probative evidence pertinent to the claim's interpretation. However, without such evidentiary conflict, claim interpretation may be resolved as an issue

of law by the court . . ." (citation omitted)); see [**73] also *Tol-O-Matic Inc. v. Proma Produkt-Und Mfg.*, 945 F.2d 1546, 1552, 20 U.S.P.Q.2D (BNA) 1332, 1338 (Fed. Cir. 1991) (substantial evidence supported jury's presumed fact findings on disputed terms and prosecution history); *SmithKline Diagnostics Inc. v. Helena Lab. Corp.*, 859 F.2d 878, 885, 8 U.S.P.Q.2D (BNA) 1468, 1474 (Fed. Cir. 1988) (fact findings on disputed prosecution history clearly erroneous); *Perini America v. PCM Co.*, 832 F.2d 581, 586, 4 U.S.P.Q.2D (BNA) 1621, 1625 (Fed. Cir. 1987) (in bench trial, court's interpretation of disputed claim terms not clearly erroneous); *Tillotson Ltd. v. Walbro Corp.*, 831 F.2d 1033, 1039, 4 U.S.P.Q.2D (BNA) 1450, 1454 (Fed. Cir. 1987) (vacating summary judgment where construction turns on factual disputes arising from specification, prosecution history, and industry practice); *Tandon Corp. v. ITC*, 831 F.2d 1017, 1021, 4 U.S.P.Q.2D (BNA) 1283, 1286 (Fed. Cir. 1987) (Commission's findings on prosecution history and meaning of terms supported by substantial evidence); *H.H. Robertson Co. v. United Steel Deck Inc.*, 820 F.2d 384, 389, 2 U.S.P.Q.2D (BNA) 1926, 1929 (Fed. Cir. 1987) (in bench trial, court's fact findings on claim terms not clearly erroneous); *Hovew's Medical Components* [**74] *Inc.*, 814 F.2d 638, 646, 2 U.S.P.Q.2D (BNA) 1271, 1275 (Fed. Cir. 1987) (vacating summary judgment because of fact issues surrounding prosecution history); *Moeller v. Tonetics, Inc.*, 794 F.2d 653, 657, 229 U.S.P.Q. (BNA) 992, 995 (Fed. Cir. 1986) (vacating summary judgment where terms create underlying fact dispute); *Palumbo v. Don-Joy Co.*, 762 F.2d 969, 976, 226 U.S.P.Q. (BNA) 5, 9 (Fed. Cir. 1985) (vacating summary judgment where fact question of equivalents of "means plus function" claim disputed); *Bio-Rad Lab., Inc. v. Nicolet Instrument Corp.*, 739 F.2d 604, 614, 222 U.S.P.Q. (BNA) 654, 662 (Fed. Cir. 1984) (substantial evidence supported jury interpretation of disputed terms); *McGill Inc. v. John Zink Co.*, 736 F.2d 666, 675, 221 U.S.P.Q. (BNA) 944, 951 (Fed. Cir. 1984) (reversing jury verdict where construction premised on facts not supported by substantial evidence). So it is remarkable that the court so casually changes its collective mind, especially when the just cited precedent was compelled by the *Seventh Amendment* and not the mere preference of a sufficient number of judges.² The court's revisionist reading of precedent to loose claim interpretation from its factual foundations will have profoundly [**75] negative consequences for the well-established roles of trial judges, juries, and our court in patent cases.

2 The court pretends there is a line of contrary authority. *Ante* at 12, 14. But most of its cases arrived at this court after bench trials – a puzzling source for guidance on the commands of the *Seventh Amendment*; others actually implicating the right to a jury trial sprang from facts simply inadequate to support a reasonable jury verdict. Indeed, the one case that pays lip service to this novel rule, *Read Corp. v. Portec, Inc.*, 970 F.2d 816, 822-23, 23 U.S.P.Q.2D (BNA) 1426, 1432-33 (Fed. Cir. 1992), like this case, did not require excursion beyond the patent documents themselves. There may be a reason why the court is hellbent for its result, but it does not emanate from the cases.

I.

Anyone who wants to know what a patent protects must first read its claims, for they are the measure of its scope. *Aro Mfg. Co. v. Convertible Top Replacement Co.*, 365 U.S. 336, 339, 5 L. Ed. 2d 592, 81 S. Ct. 599 (1961). Claim language does [**76] not exist in a vacuum; it must be understood by reference to the documents annexed to the patent grant, including the specification, of which the claims are a part, and any drawings. *Autogro Co. of Am. v. United States*, 384 F.2d 391, 397, [**91] 181 Ct. Cl. 55, 155 U.S.P.Q. (BNA) 697, 702 (Ct. Cl. 1967). The prosecution history often proves useful in determining a patent's scope, for it reveals the course of dealing with the Patent Office, which may show a particular meaning attached to the terms, or a position taken by the applicant to ensure that the patent would issue. *Graham v. John Deere Co.*, 383 U.S. at 33. These documents are always available during the course of claim interpretation; they are not extrinsic evidence, though some opinions so characterize them, because they are essentially incorporated into the patent itself.

Patents are directed to those skilled in the art. The task of determining just what the claims mean to skilled artisans falls, in the first instance, to the court. But if, after consideration of all of this documentation, the judge cannot readily resolve the meaning of the claims, he resorts to extrinsic evidence to shed light on them. *Moeller*, 794 F.2d at 637, 229 U.S.P.Q. (BNA) at [**77] 995 (trial judge's failure to allow expert testimony was abuse of discretion). This evidence, in the form of prior art documentary evidence or expert testimony, can show

what the claims would mean to those skilled in the art. The content of the prior art and the testimony of technical experts can reveal how others use and understand technical terms that may appear ambiguous or opaque to the judge, who rarely has the knowledge of those skilled in the field of the patent. The inventor himself may qualify as an expert and testify what his claims would mean in the relevant art.³ The judge can even advert to the testimony of patent law experts – that is, patent lawyers – for advice on the interpretation of claims.⁴ If this information clarifies the meaning of the claims and is uncontested, the judge may rule as a matter of law.

3 Of course, the inventor's testimony as to what he intended or how he understands the patent, as opposed to his testimony as an expert, may be relevant, but is entitled to little weight in the face of evidence to the contrary. See *North American Vaccine v. American Cyanamid Co.*, 7 F.3d 1571, 1577, 28 U.S.P.Q.2D (BNA) 1333, 1337 (Fed. Cir. 1993) (inventor's "after-the-fact testimony is of little weight compared to the clear import of the patent disclosure itself"); *Intellicoll, Inc. v. Phonometrics, Inc.*, 952 F.2d 1384, 1387, 21 U.S.P.Q.2D (BNA) 1383, 1386 (Fed. Cir. 1992) ("where a disputed term would be understood to have its ordinary meaning by one of skill in the art from the patent and its history, extrinsic evidence that the inventor may have subjectively intended a different meaning does not preclude summary judgment").

[**78]

4 A fact dispute cannot arise solely from testimony of a patent law expert. While this sort of testimony is acceptable, even if often overdone, as an interpretive aid to the court, it is not evidence and cannot create a genuine fact question for the jury. See *Nutrition 21 v. United States*, 930 F.2d 862, 871 n.2, 18 U.S.P.Q.2D (BNA) 1347, 1350 n.2 (Fed. Cir. 1991) (patent law expert's "opinion on the ultimate legal conclusion is neither required nor indeed 'evidence' at all"); see also *Avia Group Int'l, Inc. v. L.A. Gear Cal., Inc.*, 853 F.2d 1537, 1564, 7 U.S.P.Q.2D (BNA) 1548, 1554 (Fed. Cir. 1988) (conflicting opinions of legal experts create no material issue of fact).

But sometimes extrinsic evidence results in a genuine dispute over the meaning of a term or an event

during prosecution. ⁵ When that happens, it falls to the finder of fact to settle it. *Lenelson*, 968 F.2d at 1206, 23 U.S.P.Q.2D (BNA) at 1288; *Tol-O-Matic Inc. v. Prima Produkt-Und Mktg.*, 945 F.2d at 1550, 20 U.S.P.Q.2D (BNA) at 1336; *SmithKline Diagnostics Inc. v. Helena Lab. Corp.*, 859 F.2d at 882, 8 U.S.P.Q.2D (BNA) at 1472; *Palumbo v. Don-Joy Co.* [*79], 762 F.2d at 974, 226 U.S.P.Q. (BNA) at 8.

5 Of course, not every disagreement gives rise to a genuine fact question. *Johnston v. IVAC Corp.*, 885 F.2d 1574, 1580, 12 U.S.P.Q.2D (BNA) 1382, 1386 (Fed. Cir. 1989); see also *Senned Inc. v. Richard-Allan Medical Indus.*, 888 F.2d 815, 819 n.8, 12 U.S.P.Q.2D (BNA) 1508, 1512 n.8 (1989) (inventor's testimony as to meaning of "on" contrary to ordinary meaning raised no real "dispute").

When a question of claim construction arrives here on appeal, this court reviews the ultimate construction given the claims under the de novo standard applicable to all legal conclusions. But any facts found in the course of interpreting the claims must be subject to the same standard by which we review any other factual determinations: for clear error in facts found by a court; for substantial evidence to support a jury's verdict. *Fed. R. Civ. P. 52(a)*; *Perini America v. PCM Co.*, 832 F.2d at 584, 4 U.S.P.Q.2D (BNA) at 1624; *McGill Inc. v. John Zink Co.*, 736 F.2d at 672, 221 U.S.P.Q. (BNA) at 948.

This standard recognizes [*80] the jury's important role in making factual determinations, [*992] and the role of the trial court as the primary decisionmaker in bench trials. A trial is "the 'main event' . . . rather than a 'tryout on the road.'" *Anderson v. City of Bessemer City*, 470 U.S. 564, 575, 84 L. Ed. 2d 518, 105 S. Ct. 1504 (1985). By broadly proclaiming all aspects of claim interpretation to be legal, the court today usurps a major part of the functions of both trial judge and jury in patent cases, obliterating the traditional, defined differences between the roles of judge and jury, and trial and appellate courts.

II.

Beyond any policy argument supporting the traditional roles of judge and jury in patent cases, the court's decision today flies in the face of the constitutional right to a jury promised by the *Seventh Amendment of the Constitution*. That promise: "in suits at

common law, where the value in controversy shall exceed twenty dollars, the right of trial by jury shall be preserved," protects litigants' right to a jury trial where legal, as opposed to equitable, causes are to be determined. *Chauffeurs, Teamsters & Helpers Local No. 391 v. Terry*, 494 U.S. 558, 564, 108 L. Ed. 2d 519, 110 S. Ct. 1339 (1990). The amendment does not create an independent right [*81] to trial by jury but gives parties rights equivalent in scope to those that existed at common law, in England in 1791, when the *Bill of Rights* was ratified. *Tull v. United States*, 481 U.S. 412, 417, 95 L. Ed. 2d 365, 107 S. Ct. 1831 (1987). It does not stop there, however; it extends as well to statutory actions subsequently created by Congress if they are analogous to actions decided in the law courts of eighteenth century England. *Id.*

The *Seventh Amendment* does not guarantee the right to have a jury decide all issues in a case. It properly resolves only factual questions, while legal matters are for the court. Even within the realm of factual questions, whether a particular question must always go to the jury depends "on whether the jury must shoulder this responsibility as necessary to preserve the 'substance of the common-law right of trial by jury.'" *Id.* at 426 (quoting *Colgrove v. Battin*, 413 U.S. 149, 152, 37 L. Ed. 2d 522, 93 S. Ct. 2448 (1973)). The *Seventh Amendment* was intended not to formalize any particular rigid procedural rules, but "to preserve the basic institution of trial by jury in only its most fundamental elements" *Parklane Hosiery Co. v. Shore*, 439 U.S. 322, 337, 58 L. Ed. 2d 552, 99 S. Ct. 645 (1979) (quoting *Galloway v. United States*, 319 U.S. 372, 392, 87 L. Ed. 1458, 63 S. Ct. 1077 (1943)); see also *Baltimore & Carolina Line, Inc. v. Redman*, 295 U.S. 654, 657, 79 L. Ed. 1636, 55 S. Ct. 890 (1935) ("particularly to retain the common-law distinction between the province of the court and that of the jury"). But where a particular issue goes to these "fundamental elements" or the "substance of the common-law right of trial by jury," no court may constitutionally remove it from the jury. See *Walker v. New Mexico & So. Pac. R. Co.*, 165 U.S. 593, 596, 41 L. Ed. 837, 17 S. Ct. 421 (1897) (*Seventh Amendment* "requires that questions of fact in common law actions shall be settled by a jury, and that the court shall not assume directly or indirectly to take from the jury or to itself such prerogative."); see also *Grafinfinanciera S.A. v. Nordberg*, 492 U.S. 33, 51, 106 L. Ed. 2d 26, 109 S. Ct. 2782 (1989) (even Congress "lacks the power to strip parties contesting matters of private right of their

constitutional right to a trial by jury."). The court's action in this case does just that.

An action for patent infringement is one that would have been heard in the law courts of old England. See, e.g., *Bramah v. Hardcastle*, 1 Carp. P.C. 168 (K.B. 1789), reprinted in 1 *Decisions on the Law of Patents for Inventions* 51, [*83] 53 (Benjamin V. Abbott ed.) (1887) [hereinafter *Abbott*] (jury trial of infringement action; jury instructed that patent was invalid, but jury verdict for plaintiff not disturbed); *Morris v. Bramson*, 1 Carp. P.C. 30 (K.B. 1776), reprinted in *Abbott*, supra, at 21 (jury trial of infringement action); see also *Boulton v. Bull*, 1 Carp. P.C. 117 (C.P. 1795), reprinted in *Abbott*, supra, at 59, 74 ("Infringement or not, is a question for the jury; in order to decide this case, they must understand the nature of the improvement or thing infringed . . ."). In this country, a jury trial has always been available in patent cases where damages are sought. Indeed, [*993] the first Patent Act, in 1790, expressly provided that a patent owner was entitled to "such damages as shall be assessed by a jury." Act of April 10, 1790, ch. 7, § 4. 1 Stat. 109. In such cases, the jury has been entrusted with ruling on the ultimate question of infringement, as well as any factual disputes that arise subsidiary to the determination of the legal question of patent validity.

Not infrequently, the ultimate question of infringement, indisputably a matter for the jury, is effectively dictated [*84] by the construction given the patent claims. This happens, of course, when the judge affirmatively takes the question from the jury by granting summary judgment or judgment as a matter of law, as it did here; it can also occur when, even though the judge sends the question to the jury, his interpretation of the claims forces the jury's decision on infringement. That is to say, choosing between contending interpretations of a claim can decide the matter of infringement for all intents and purposes. Our constitutional mandate to preserve the right to jury trial therefore demands that we view any intrusion on the jury's role in deciding infringement with deep suspicion. See *Dimick v. Schiedt*, 293 U.S. 474, 486, 79 L. Ed. 603, 53 S. Ct. 296 (1935) ("Maintenance of the jury as a fact-finding body is of such importance and occupies so firm a place in our history and jurisprudence that any seeming curtailment of the right to a jury trial should be scrutinized with utmost care.").

Today's decision also threatens to do indirectly what

we have declined to do directly, that is, create a "complexity exception" to the *Seventh Amendment* for patent cases. See *SRI Int'l v. Matsushita Elec. Corp. of Am.*, 775 F.2d 1107, [*85] 1130, 227 U.S.P.Q. (BNA) 577, 592 (Fed. Cir. 1985) (Markey, C.J., additional views). But there is simply no reason to believe that judges are any more qualified than juries to resolve the complex technical issues often present in patent cases. *Id.* at 1128 & n.7, 227 U.S.P.Q. (BNA) at 591 & n.7. Indeed, the effect of this case is to make of the judicial process a charade, for notwithstanding any trial level activity, this court will do pretty much what it wants under its *de novo* retrial. We have consistently stressed that the same rules apply to patent cases as apply to all other civil disputes. *Connell v. Sears, Roebuck & Co.*, 722 F.2d 1542, 1547, 220 U.S.P.Q. (BNA) 193, 197 (1983) ("So long as the *Seventh Amendment* stands, the right to a jury trial should not be rationed, nor should particular issues in particular types of cases be treated differently from similar issues in other types of cases."). The court subverts this principle and the demands of the *Seventh Amendment* by the ruse of reclassifying factual questions as legal ones.

III.

Those who argue for interpretation of claims solely as a matter of law by the judge spew a panoply of cases ostensibly in support. Close examination of these cases, [*86] however, reveals that, like the one before us today, interpretation of the claims at issue before the deciding court presented no real factual question. Thus, for example, in *Hogg v. Emerson*, 47 U.S. (6 How.) 437, 484, 12 L. Ed. 505 (1848), the Court stated that "without the aid of experts and machinists, [we have] no difficulty in ascertaining, from the language used here," the meaning of the patent. Similarly, *Winans v. New York & Erie R.R. Co.*, 62 U.S. (21 How.) 88, 100, 16 L. Ed. 68 (1858), allowed the possibility that "experts may be examined to explain terms of art, and the state of the art at any given time. They may explain to the court and jury the machines, models, or drawings exhibited." But the Court went on to say that there was only one construction of the patent "which the language of this specification will admit" and "it would be wholly superfluous to examine experts to teach the court, what they could clearly perceive without such information." *Id.* at 101. *Brown v. Piper*, 91 U.S. 37, 41, 23 L. Ed. 200 (1847), recognized that evidence on "what was old and in general use at the time of the alleged invention" was admitted at

the trial but that it was unnecessary. "We think the patent was void [*87] on its face, and that the court might have stopped short at that instrument, and without looking beyond it into the answers and testimony, sua sponte, if objection were not taken by counsel, well have adjudged in favor of the defendant." *Id.* at 44. [*994] See also *U.S. Indus. Chem., Inc. v. Carbide & Carbon Chem. Corp.*, 315 U.S. 668, 677, 86 L. Ed. 1105, 62 S. Ct. 839 (1941) ("On the face of the papers, the process described in the original patent included a step [omitted from the reissue]," and the trial court erroneously relied on unnecessary expert opinion in its improper conclusion that the reissue was not invalid.); *Exhibit Supply Co. v. Ace Corp.*, 315 U.S. 126, 134, 86 L. Ed. 736, 62 S. Ct. 513 (1941) ("examination of the drawings and specifications indicates clearly enough" the meaning of the claim); *Smith v. Snow*, 294 U.S. 1, 14, 79 L. Ed. 721, 55 S. Ct. 279 (1934) ("Examination of the claim, in light of both [undisputed] scientific fact and of the particular form in which the petitioner reduced the claim to practice as described in the specifications, makes it plain" what are the claim's relevant limitations).

These cases simply do not address the effect of extrinsic evidence giving rise to a legitimate fact question. They are cases where the documentary [*88] record alone was wholly adequate to derive the patent's proper construction.⁶ It is hardly surprising that courts would treat claim interpretation under these circumstances as a matter of law, for it could not be otherwise. See *Fed. R. Civ. P. 50(a)* (court may grant judgment as a matter of law where underlying facts could not support reasonable jury verdict to the contrary), and 56(c) (summary judgment appropriate where there is no genuine issue as to any material fact); *Newell Companies, Inc. v. Kenney Mfg. Co.*, 864 F.2d 757, 762, 763, 9 U.S.P.Q.2D (BNA) 1417, 1421-22 (1988) (approving use of judgment as a matter of law and summary judgment on obviousness where underlying facts are not disputed).

6 In one case where it appeared the Court "availed itself of the light furnished by the evidence to enable it to understand the terms used in the patent and the devices and operations described or alluded to therein," *Webster Loom Co. v. Higgins*, 105 U.S. 580, 586, 26 L. Ed. 1177 (1881), the evidence was examined in ruling on the issue of enablement, i.e., whether those of skill in the art would understand the terms of the patent. Even given the conflicting testimony, the

Court concluded that the terms of the patent were "sufficiently clear and full in the description of the invention." *Id.* at 589. When it reached the question of infringement, however, it did not mention any evidence other than the specification and claims and stated "if we examine the language of the claim [in light of the specification], it seems to us that all doubt as to its meaning is removed." *Id.* at 598. There was no reliance on any extrinsic evidence in construing the claims for purposes of infringement.

[**89] Indeed, some cases cited in support of a purported rule that claim construction is always entirely a matter of law expressly limit the rule to those cases where the patent may be understood on the basis of the documents alone, without resort to extrinsic evidence; these cases acknowledge that fact questions could be raised that would require submission to a jury. In *Heald v. Rice*, 104 U.S. 757, 749, 26 L. Ed. 910 (1881), the Supreme Court explained:

That is, if it appears from the face of the instruments that extrinsic evidence is not needed to explain terms of art, or to apply the descriptions to the subject-matter, so that the court is able from mere comparison to say what is the invention described in each, and to affirm from mere comparison that the inventions are not the same, but different, then the question of identity is one of pure construction, and not of evidence, and consequently is a matter of law for the court, without any auxiliary matter of fact to be passed upon by a jury, if the action be at law.

The Court there determined that it had a case in which the question could be determined "from the mere reading of the two specifications" and that it was "too plain [*90] for argument that they are perfectly distinct." *Id.* at 753; see also *Singer Mfg. Co. v. Cramer*, 192 U.S. 265, 275, 48 L. Ed. 437, 24 S. Ct. 291 (1903) ("As in each of the patents in question it is apparent from the face of the instrument that extrinsic evidence is not needed . . . the question of infringement or no infringement is one of law . . ."); *Market St. Cable Ry. Co. v. Rowley*, 155 U.S. 621, 625, 39 L. Ed. 284, 15 S. Ct. 224 (1894) (same as *Heald v. Rice*). These cases recognize that where extrinsic evidence is required and raises a real factual dispute, the

question is no longer one of "pure construction," so that the jury must play its role in the construction of the claims.

[*995] But where the question has arisen -- where the proper construction of claims depends on the resolution of a factual dispute -- the Supreme Court has stated in no uncertain terms that the jury has the duty to decide. These are cases where the meaning of a patent may not be derived from its terms alone, forcing the judge to go beyond the documentary evidence for aid. This gives rise to issues of historical fact the resolution of which must be left to a jury.

The claim before the court in *Silsby v. Foote*, 55 U.S. (14 How.) 218, 14 L. Ed. 394 (1852), was directed [*991] to "the combination, above described, by which the regulation of the heat of the stove, or other structure in which it may be used, is effected." *Id.* at 226. The specification disclosed a stove containing a number of discrete parts. To be sure, the judge "construed the claim": he instructed the jury that it covered "a combination of such of the described parts as were combined and arranged for the purpose of producing a particular effect, viz., to regulate the heat of a stove." *Id.* at 225. But the defendants asked the judge to rule as a matter of law that the parts referred to in the claim were "the index, the detaching process, and the pendulum." *Id.* at 226. The trial court refused, holding that this question was for the jury.

The Supreme Court affirmed asking, "How could the Judge know this as a matter of law?" *Id.* Once the trial court had construed the claim and instructed the jury, "it therefore became a question for the jury, upon the evidence of experts, or an inspection by them of the machines, or upon both, what parts described did in point of fact enter into, and constitute an essential part of this combination." *Id.* Only then could the jury determine [*992] if the accused device contained all of these elements and was therefore an infringement. The Court said the "defendants' counsel exhibited to the court the models of the machines of the defendants and the plaintiff, for the purpose of satisfying the court the jury must have understood they were at liberty to construe the claim, and that they did in truth so construe it, as to exclude from the combination claimed by the plaintiff, what is called the detaching process." *Id.* (emphasis added).

Again in *Winans v. Denmead*, 56 U.S. (15 How.)

330, 14 L. Ed. 717 (1853), the court "construed" the claim in a general manner and left it for the jury to fill in the specifics. The claim at issue was directed to a rail car for the transportation of coal "in the form of a frustum of a cone, substantially as herein described, whereby the force exerted by the weight of the load presses equally in all directions." *Id.* at 342. The defendant requested the jury be instructed that the claim was limited to a circular form only, as was described in the specification and did not cover the defendant's rectilinear design. The Supreme Court affirmed the trial court's refusal of the instructions, stating that [*993] "where the whole substance of the invention may be copied in a different form, it is the duty of the courts and juries to look through the form for the substance of the invention -- for that which entitled the inventor to his patent, and which the patent was designed to secure." *Id.* at 343.

The Court considered how far an alleged infringing car could depart from the form of a perfect circle and still infringe, and determined that the claim encompassed anything "so near to a true circle as substantially to embody the patentee's mode of operation, and thereby attain the same result as was reached by his invention." *Id.* at 344. It cited evidence, including expert testimony as to the mode of operation of the patentee's car and whether the accused car attained the same results as the claimed car. The Court unmistakably left it to the jury to determine the meaning of the claim, its scope, and refused to proclaim it a matter of law outside the province of the jury. *Id.*

These cases are especially relevant because they show that the jury has always had a role in determining a patent's scope. This historic reliance on juries to aid the court in deciding exactly what patents protect [*994] matters here because the *Seventh Amendment* demands that courts preserve the right to jury trial as it existed at common law. Old cases are obviously instructive under this peculiar standard. Accordingly, efforts to distinguish *Silsby* and *Winans* because of [*996] their age are disingenuous. This court has no office to invoke desuetude to evade the *Seventh Amendment* and the Supreme Court.

Our patent laws have always required inventors to point out their inventions in detail sufficient to both distinguish the prior art and tell the public what protection the patent confers. The very first patent act required that letters patent "describe the said invention or

discovery, clearly, truly, and fully." Act of Apr. 10, 1790, ch. 7, § 1, 1 Stat. 109. The applicant for a patent was at the time required to submit "a specification in writing, containing a description . . . of the thing or things by him or them invented or discovered, . . . which specification shall be so particular . . . as . . . to distinguish the invention or discovery from other things before known and used." *Id.* § 2. The word "claim" first appeared in the Act of 1836, ch. 357, § 6, 5 Stat. 117 (July 4, 1836), requiring [*95] that the applicant "shall particularly specify and point out the part, improvement, or combination, which he claims as his own invention." Claims, per se, were not expressly required until the Act of 1870, ch. 230, § 26, 16 Stat. 198 (July 8, 1870), which said the applicant "shall particularly point out and distinctly claim the part, improvement, or combination which he claims as his invention or discovery", but they were in common use much earlier in rudimentary form. See, e.g., *Evans v. Eaton*, 20 U.S. 356, 7 Wheat. 356, 428, 5 L. Ed. 472 (1822) (Specification concluded: "I claim as my invention, the peculiar properties or principles which this machine possesses, in spreading, turning and gathering the meal, at one operation, and the rising and lowering its arms, by its motion, to accommodate itself to any quantity of meal it has to operate on.").

In light of this history, it is apparent that the 1870 Act simply codified the preference for particular claiming already expressed by the Supreme Court. See *Brooks v. Fiske*, 56 U.S. (15 How.) 212, 215, 14 L. Ed. 665 (1853) (specification and drawings to be considered "only for the purpose of enabling us to correctly interpret the claim"). This change [*96] from a regime of "central" claiming to one of "peripheral" claiming may seem a major step in the patent discipline, but the distinction it represents is irrelevant to the *Seventh Amendment*. When the trial court in *Silsby* construed the claim there at issue, it was performing essentially the same task of claim construction as courts perform today. When the judge then left it for the jury to clarify the ambiguity as to just what elements the claims encompassed, he recognized the existence of a jury question precisely the same as that which the court rejects today.

Even if it were correct that the 1870 Act created a new and different claiming requirement out of whole cloth, I see no evidence that Congress thereby intended to strip the jury of its traditional role in determining patent scope. Indeed, the *Seventh Amendment's* command that we preserve jury trial rights as they existed at common

law dictates that Congress could not have taken the question from the jury even if it wanted to. See *Granfinanciera*, 492 U.S. at 51 (Congress "lacks the power to strip parties contesting matters of private right of their constitutional right to a trial by jury"; private rights involve "the [*97] liability of one individual to another under the law as defined") (quoting *Crowell v. Benson*, 285 U.S. 22, 50, 76 L. Ed. 598, 52 S. Ct. 285 (1932)).

Cases involving patent interpretation in the validity context reach the same result. ⁷ For example, in *Bischoff v. Wethered*, 76 U.S. (9 Wall.) 812, 19 L. Ed. 829 (1869), the Court explained that although it was normally the "province of the court, and not the jury, to construe the meaning of documentary evidence," the "specifications of patents for inventions are documents of a peculiar kind." *Id.* at 815. The Court stated further that inventions, the subjects of patents, "have their existence in pais, outside of the documents themselves; and which are commonly described by terms of art or mystery to which they respectively belong; and these [*97] descriptions and terms of art often require peculiar knowledge and education to understand them aright." *Id.* Accordingly, an understanding of the patented invention "is to be properly sought, like the explanation of all latent ambiguities arising from the description of external things, by evidence in pais," outside of the patent document. *Id.* This inquiry "belongs to the province of evidence, and not that of construction." [*98] and thus falls to the jury. *Id.* at 816.

7 Cases about patent validity are authoritative on the issue of claim construction. A claim must be interpreted the same for both validity and infringement. E.g., *SmithKline Diagnostics Inc. v. Helena Lab. Corp.*, 859 F.2d 878, 882, 8 U.S.P.Q.2D (BNA) 1468, 1471 (Fed. Cir. 1988). A claim must be construed before determining its validity just as it is first construed before deciding infringement.

This illustrates how claim construction may sometimes require the resolution of factual matters before a claim can be authoritatively construed. The exercise is further informed by decisions interpreting analogous instruments. For patents are legal documents like contracts or deeds. See *Goodyear Dental Vulcanite Co. v. Davis*, 102 U.S. 222, 227, 26 L. Ed. 149 (1880) (patent as contract); *Motion Picture Patents Co. v. Universal Film*

Atfig. Co., 243 U.S. 502, 510, 61 L. Ed. 871, 37 S. Ct. 416 (1917) (patent as deed). The analogies are most apt. A patent can be conceived of as a contract between the inventor and the government. [*99] In return for full disclosure of the invention the government gives a monopoly of sorts for a time. The rest of us may be third party beneficiaries of this deal, partaking of the advancement of knowledge the patent represents. Or a patent may be thought of as a form of deed which sets out the metes and bounds of the property the inventor owns for the term and puts the world on notice to avoid trespass or to enable one to purchase all or part of the property right it represents. The public holds a vested future interest in the property. Accordingly, patents should be interpreted under the same rules as govern interpretation of kindred documents. *Merrill v. Yeomans*, 94 U.S. 568, 571, 24 L. Ed. 235 (1877). The interpretation of a contract or a deed, like a patent, is ultimately a question of law. There is nothing novel about the principle that, in the words of Justice Story, "the interpretation of written documents properly belongs to the Court, and not to the jury." *Brown & Co. v. McGran*, 39 U.S. (14 Pet.) 479, 493, 10 L. Ed. 550 (1840). This principle has been routinely evoked in the context of contract law. See *Levy v. Gadsby*, 7 U.S. 180, 3 Cranch 180, 186, 2 L. Ed. 404 (1805) ("the construction of a written [*100] evidence is exclusively with the court"); *Goddard v. Foster*, 84 U.S. (17 Wall.) 123, 142, 21 L. Ed. 589 (1872) ("It is well-settled law that written instruments are always to be construed by the court . . ."); see also *Meredith v. Pickett*, 22 U.S. 573, 254, 9 Wheat. 573, 575, 6 L. Ed. 163 (1824) (interpreting a deed. "The Judges must construe the words of an entry, or any other title paper, according to their own opinion of the words as they are found in the instrument itself").

In light of such emphatic Supreme Court language, one might conclude that the meaning of a contract is first and last a question of law which in no instance should be resolved by a factfinder. But as Justice Story also was careful to point out in *McGran*, "there certainly are cases, in which, from the different senses of the words used, or their obscure and indeterminate reference to unexplained circumstances, the true interpretation of the language may be left to the consideration of the jury for the purpose of carrying into effect the real intention of the parties." 39 U.S. (14 Pet.) at 493.

Story used the facts of *McGran* to illustrate the point. One issue was the meaning of certain words used by the

parties in letters [*101] which formed an agreement on the sale of cotton. The language was susceptible of more than one interpretation and its meaning would depend on the surrounding circumstances. Therefore, the trial judge properly refused to tell the jury what the letters meant, because to do so would have removed from the jury "matters of fact in controversy before the jury upon which it was exclusively their province to decide." *Id.*

Goddard v. Foster similarly held that written instruments are for the court "except when they contain technical words, or terms of art, or when the instrument is introduced in evidence collaterally, and where its effect depends not merely on the construction and meaning of the instrument, but upon extrinsic facts and circumstances, in which case the inference to be drawn from it must be left to the jury." 84 U.S. (17 Wall.) at 142. See also *Reed v. Proprietors of Locks & Canals* [*998] on *Merrimac River*, 49 U.S. (8 How.) 274, 289, 12 L. Ed. 1077 (1850) (allowing jury to interpret vague or ambiguous deed, where "it necessarily becomes a fact for the jury to decide, whether the land in controversy is included therein").

The principle that documentary interpretation is a matter of law [*102] has become a basic tenet of modern contract law. Equally established, however, is the caveat that extrinsic evidence, such as custom and usage of the trade and course of dealing between the parties, akin to prior art, level of skill in the art, and events in the Patent Office, may be introduced to inform the meaning of terms in the contract. And when such evidence is brought in and creates a real conflict, it results in a question of fact for the jury. *Great N. Ry. Co. v. Merchants Elevator Co.*, 259 U.S. 285, 292, 66 L. Ed. 943, 42 S. Ct. 477 (1922); cf. *Reed*, 49 U.S. (8 How.) at 290 (meaning of deed). This is true even though in some circumstances the factual exercise of assigning meaning to a term of a contract serves to decide the meaning of the contract. Until today, the same rule has applied in the interpretation of patents.⁸

8 After emphasizing that patents are construed according to the same rules that apply to other legal instruments, the court decides that a patent is like a contract or a deed in the context of disputes over its creation or its validity, but that when it comes to the question of infringement, a patent is like a statute. Wholly aside from the metaphysical implications of this curious duality to the

traditional rule that patents are interpreted for validity just as they are for infringement, it is simply a bogus analogy.

Patents cannot be baby statutes because they are prepared ex parte by interested parties, drafted in the lower reaches of an executive department, and issued ministerially by a political officer. They have none of the indicia of a real statute, but the court imbues them with a transconstitutional power to compromise the role of juries in the third branch of government. Not even a congressionally passed, presidentially signed law can match that. See *Granfinanciera S.A. v. Nordberg*, 492 U.S. 33, 51, 106 L. Ed. 2d 26, 109 S. Ct. 2782 (1989).

[**103] RADER, Circuit Judge, concurring in the judgment.

The result in this case is the same whether or not claim construction may sometimes involve subsidiary fact issues. In this case, the claims, specification, and prosecution history irrefutably show that cash transaction totals are not "inventory." Inventor Markman's "after-the-fact testimony" to the contrary "is of little weight compared to the clear import of the patent disclosure itself." *North Am. Vaccine, Inc. v. American Cyanamid Co.*, 7 F.3d 1571, 1577, 28 U.S.P.Q.2D (BNA) 1333, 1337 (Fed. Cir. 1993), cert. denied, 128 L. Ed. 2d 365, 114 S. Ct. 1645 (1994). The testimony of Markman's patent law expert is not evidence at all. Cf. *Nutrition 21 v. United States*, 930 F.2d 867, 871 n.2, 18 U.S.P.Q.2D (BNA) 1347, 1350 n.2 (Fed. Cir. 1991). In sum, the record lacks substantial evidence supporting Markman's asserted claim interpretation. Thus, the trial court correctly granted judgment as a matter of law that Westview did not infringe. See *Reed Corp. v. Portec, Inc.*, 970 F.2d 816, 821, 23 U.S.P.Q.2D (BNA) 1426, 1431 (Fed. Cir. 1992). To dispose of this case, this court need not decide whether subsidiary fact issues may sometimes arise. Markman cannot manufacture [**104] a fact issue where none exists. This court's extensive examination of subsidiary fact issues is dicta.

In commenting on this concurrence, the court claims that whether claim construction can involve subsidiary fact issues "is before us and it is our obligation to decide it." The court, however, neglects the logically antecedent question of whether substantial evidence supports the jury finding rejected by the trial court. See *Reed*, 970 F.2d at 821. Where, as here, substantial evidence does

not support the finding, it does not matter whether the issue is one of law or fact.

Whether claim construction can involve subsidiary fact issues is not before us. It is our duty not to rule on this question. The court should decline to answer a question better left to a case that truly raises it, and therefore provides an informed basis for its resolution.

Transaction totals are not, as a matter of law, "inventory." Westview infringes only if transaction totals are "inventory." Therefore, the district court correctly granted [*999] judgment as a matter of law that Westview does not infringe. I concur in the judgment.

DISSENT BY: NEWMAN

DISSENT

NEWMAN, Circuit Judge, dissenting.

I

[**105] INTRODUCTION

The issue is the role of the jury in patent infringement cases. The majority opinion resolves the issue by designating, as law, factual disputes about the meaning and scope of the technologic terms and words of art used to define patented inventions. By holding that these disputed technologic questions are matters of law, the court holds that issues of patent infringement, previously triable to a jury as of right, will now be decided by the trial judge and then re-decided de novo by this court on appeal.

Patent infringement is a factual question. Its resolution often requires finding the factual meaning and scope of the terms of scientific art and technology and usage by which the patentee described and claimed the invention. These findings usually require testimonial and documentary evidence and occasionally experiments or demonstrations, as illustrated in many of our previous decisions that are now overruled.

Deciding the meaning of the words used in the patent is often dispositive of the question of infringement. Thus in the case at bar the infringement controversy is decided by finding the meaning and scope of the term "inventory" in Markman's patent, [**106] in light of the accused Westview system: if "inventory" is limited to clothing, the patent is not infringed; if "inventory" includes

invoices, it is. The majority holds that this is a matter of law, devoid of any factual component; and subject to de novo appellate determination. The jury is eliminated, and new and uncertain procedures are imposed on trial judges.

This holding not only raises a constitutional issue of grave consequence, but the court creates a litigation system that is unique to patent cases, unworkable, and ultimately unjust. Thus I must, respectfully, dissent.

I shall discuss three principal concerns:

1. The Meaning of Disputed Technologic Terms and Markman of, Irt

Patents are technologic disclosures, written by and for the technologically experienced; those "of skill in the art." The meaning and scope of the terms that define the patented technology is often in dispute in infringement litigation, for it often decides the case. In resolving such dispute the trier of fact often makes findings that depend on the weight, credibility, and probative value of conflicting evidence, such as that offered on behalf of Markman and Westview. Heretofore, the disputed [**107] meaning of technologic terms and words of art has been treated by Federal Circuit precedent as an "underlying fact" on which the legal effect of the patent is based. The majority now simply rules that these are not "underlying factual inquiries." However, the meaning and scope of disputed technologic and other terms of art in particular usage are classical questions of fact. Their nature as fact does not change because their finding, like most findings in litigation, has a legal consequence. By redesignating fact as "law" the court has eliminated the jury right from most trials of patent infringement.

2. The Trial and Appellate Roles in Technologic Disputes

The trial process is the vehicle for determining truth. Thus the trier of fact is present in the courtroom along with the witnesses, the advocates, the exhibits, and the demonstrations. Indeed, when the technologic issues are complex, appellate fact finding is probably the least effective path to accurate decisionmaking. And if a factual question is technologically simple, it is not thereby transformed into a matter of law and removed from the trial process. Even were there no constitutional infirmity, I doubt that [**108] the correct resolution of technologic or scientific disputes is more likely to be

achieved by removing disputed facts from the procedures of trial and consigning them to the appellate court. Appellate briefs and fifteen minutes per side of attorney argument are not designed for de novo findings of disputed technologic questions.

[*1000] **3. The Constitution**

Jury trial in patent cases is protected by the *Seventh Amendment*. Elimination of the jury is not this court's choice to make.

The constitutional right alone bars the majority's new rule. The majority today denies 200 years of jury trial of patent cases in the United States, preceded by over 150 years of jury trial of patent cases in England, by simply calling a question of fact a question of law. The *Seventh Amendment* is not so readily circumvented.

II

FACT AND LAW IN PATENT INFRINGEMENT

A. LEGAL "CONSTRUCTION" v. FACTUAL "INTERPRETATION"

The majority's explanation for removing these factual issues from the jury is that it is "construing" the patent claims, and that the "construction" of documents is a matter of law. The legal construction of documents—patent documents and other documents—is [**109] indeed a matter of law. The legal effect of the patent claim is to establish the metes and bounds of the patent right to exclude; this is a matter of law. But this does not deprive the underlying facts of their nature as fact. These facts are found on evidence that includes the patent specification, relevant prior art, the prosecution history, the testimony of experts in the field, and other relevant evidence such as tests and demonstrations, all as I shall discuss post. These findings do not become rules of law because they relate to a document whose legal effect follows from the found facts.

An extensive body of law, statutory and judgemade, governs the construction and legal effect of patent claims; for example, that a claim is construed the same way in determining both patent validity and infringement; that a dependent claim includes all of the limitations of the independent claim; that the claims as filed are part of the technical disclosure; that the right to exclude is divisible into making, using, or selling the claimed subject matter;

that a claim is not infringed unless every element thereof is met in the accused device, either literally or by an equivalent. These and [*110] other rules of law are applied when appropriate to the facts of the particular case: either undisputed facts, or facts that are found by the trier of fact. The procedure of applying law to facts does not convert the finding of facts into a matter of law.

In patent infringement litigation there is often a factual dispute as to the meaning and scope of the technical terms or words of art as they are used in the particular patented invention. When such dispute arises its resolution is not a ruling of law, but a finding of fact. Such findings of meaning, scope, and usage have been called the "interpretation" of disputed terms of a document, as contrasted with the "construction" or legal effect of a document. Professor Corbin has explained this distinction, in the context of contracts, as reflecting the difference between "language" and the "legal operation" of language:

It may be helpful to note that the word interpretation is commonly used with respect to *language* itself -- to the symbols (the words and acts) of expression. In about the same degree, we speak of the construction of a *contract*. It is true that we also speak of construing language and of interpreting a contract; [*111] but by the latter phrase is certainly meant interpreting the *words* of a contract. The word "contract" has been variously defined: but it is seldom identified with mere symbols of expression. By "interpretation of language" we determine what ideas that language induces in other persons. By "construction of the contract," as that term will be used here, we determine its legal operation -- its effect upon the action of courts and administrative officials.

3 Arthur L. Corbin, Corbin on Contracts § 534 (1960) (footnotes omitted). The *Restatement (Second) of Contracts* § 200 and Comment c (1981) describes the distinction between "construction" and "interpretation" as reflecting the difference between the "meaning" of a term and its "legal effect":

Interpretation of a promise or agreement or a term thereof is the ascertainment of its

meaning.

[*1001] Interpretation is not a determination of the legal effect of words or other conduct.

The Reporter's Note explains that the purpose is "to make it clear that 'interpretation' relates to meaning and to avoid confusion with the ascertainment of legal operation or effect, sometimes called 'construction.'" [*112] (Citations omitted.) The analogy is apt, although a patent is not a contract, for this distinction has been recognized for many kinds of written instruments. See, e.g., *In re XTX Xenix Technologies Inc.*, 156 Bankr. 821, 829 n.6 (D. Ore. 1993) (proceeding in bankruptcy):

Interpretation and construction of written instruments are not the same. A rule of construction is one which either governs the effect of an ascertained intention, or points out what the court should do in the absence of express or implied intention, while a rule of interpretation is one which governs the ascertainment of the meaning of the maker of the instrument.

Williams v. Humble Oil & Ref. Co., 432 F.2d 165, 179 (5th Cir. 1970), cert. denied, 402 U.S. 934, 28 L. Ed. 2d 868, 91 S. Ct. 1526 (1971) (contract):

In the law of contracts (conventional obligations) a proper distinction exists between the "interpretation" of written instruments and their "construction." "Interpretation" refers to the process of determining the meaning of the words used; that process is traditionally thought to be a function of the jury. On the other hand, the process of determining the legal effect of the words used -- once we [*113] know their meaning -- is properly labelled "construction"; it is peculiarly a function of the court.

Hornick v. Owners Ins. Co., 511 N.W.2d 370 (Iowa 1993) (insurance policy):

Construction of an insurance policy--the process of determining its legal effect--is a question of law for the court. Interpretation--the process of determining

the meaning of words used--is also a question of law for the court unless it depends on extrinsic evidence or a choice among reasonable inferences to be drawn.

In re Union Trust Co., 89 Misc. 69, 151 N.Y.S. 246, 249-50 (Sur. Ct. 1915) (will):

A rule of construction is one which either governs the effect of an ascertained intention or points out what a court should do in the absence of express or implied intention. A rule of interpretation is one which governs the ascertainment of the meaning of the maker of a written document.

Reed v. Proprietors of Locks & Canals on Merrimac River, 49 U.S. (8 How.) 274, 288-89, 12 L. Ed. 1077 (1850) (deed):

It is true, that it was the duty of the court to give a construction to the deed in question, so far as the intention of the parties could be elicited therefrom. . . . But after all [*114] this is done, it is still a question of fact to be discovered from evidence dehors the deed . . . for the jury to decide, whether the land in controversy is included therein, or, in other words, was intended by the parties so to be.

It is indeed well understood that the legal effect or construction of the terms of a document, a matter of law, is not to be confused with resolution of disputes concerning the factual meaning of the terms. The former is for the court, the latter for the jury. That the thing whose terms require interpretation is a patent, instead of a deed or a will or a contract, does not convert the finding of disputed facts into a matter of law. Factual findings concerning a particular patented invention do not become matters of law simply because the patent document serves a legal purpose.

Although purity of language has occasionally slipped, for the words "construction" and "interpretation" have been loosely used, the distinction between the concepts has been recognized when it mattered. For example, Walker in his 1904 Textbook used the phrase "construction of the patent," but he left no doubt as to the role of the jury as trier of fact:

Where [*115] the question of infringement depends on the construction of the patent, and that construction depends upon a doubtful question in the prior art, the latter question should be left for the jury; and the dependent question of infringement should also be left for the jury to decide.

[*1002] A.H. Walker, Textbook on the Patent Laws of the United States of America § 536 (4th ed. 1904).

This recognition that the factual issues that underlie the "construction of the patent," and that determine patent infringement, are for the jury is manifest even in the early Supreme Court cases that are relied on by the majority, as I discuss in Part IV-C, *post*. The majority's authority does not show removal of factual disputes from the jury. Indeed, several of the cases that are relied upon were bills in equity, and irrelevant to jury trials.

B. EVIDENCE RELEVANT TO CLAIM INTERPRETATION

The areas of evidentiary inquiry commonly encountered in patent infringement cases are illustrated in Markman's case. The infringement trial (validity and damages were severed) included evidence relating to the patent specification, the patent claims, the prosecution history, the inventor's usage of [*116] "inventory," and the defendant's understanding of the term. Although Markman's invention was not complex, this phase of the trial took three days.

1. The Specification

The patent specification contains the description of the invention, including the claims. It fulfills the inventor's obligation to make known the technology for which the patent is granted, and must meet certain legal requirements. It must be written, and clear. It must be complete yet concise. It must enable one of skill in the field to make and use the invention, but need not include that which is known to the field. It must describe the best mode known to the inventor. It is a technical document, written for persons experienced in the technology. See 2 Irving Kayton et al., Patent Practice 9-1 to 9-3 (4th ed. 1989) (describing thirteen functions of the patent specification).

The claims are part of the specification. Their

purpose is to identify -- "particularly pointing out and distinctly claiming," 35 U.S.C. § 112 -- that which is the subject of the patent grant. Patent claims are terse summaries, and do not repeat the technologic content of the specification. When there arises a question [**117] as to whether a term in a patent claim is of a meaning and scope that reaches particular subject matter, the interested public and in turn the courts look to the body of the specification for elaboration and illustration of the usage of the term to define the patented technology.

When litigation ensues, it may be helpful to the trier of fact to hear from the inventor what he/she meant by the terms of art and science and technology used to describe the invention. Markman, as the inventor, testified on this aspect. It may also be helpful to hear, from others in the field of the invention, what was conveyed to them by the now-disputed terms. Markman's witness and Westview's president so testified. Not unexpectedly, the evidence was conflicting. The trier of fact may have to assess the technical content, weight, and credibility of all of the evidence, including but not limited to the specification, in finding the meaning and scope of disputed terms as used in the patent. Whether the term "inventory" in Markman's Claim 1 includes Westview's invoices can not be found in the abstract, nor by consulting a dictionary; it is found on the evidence of this case, for the specific invention and [**118] the specific accused system. This has historically been a question of fact. ¹

1 The Federal Circuit, finding this fact *en banc*, holds that the inventor Markman's testimony is "of little or no probative weight" to explain his invention, apparently because he was represented by an attorney before the patent office. The majority states that it is "not unusual" for the inventor not to know what his attorney has patented. Maj. op. at 31. This will be a revelation to the nation's patentees. The majority earlier in its opinion "rejects" Markman's testimony, maj. op. at 26, apparently based on its weight, a question of fact, not on its admissibility, a ruling of law.

The Federal Circuit has explained the relationship between law and fact in claim interpretation in many cases, all now overruled, as I illustrate in Part IV-A,B, *post*. For example, in *Perini America, Inc. v. Paper Converting Mach. Co.*, 832 F.2d 581, 4 U.S.P.Q.2D

(BNA) 1621 (Fed. Cir. 1987) the patented invention related to machines having embosser rolls [**119] [*1003] used in manufacturing paper towels. Typical of the technologic terms in dispute was "the projections in one web intermediate the projections in the other web" to describe the alignment of the embosser rolls. This court recognized that the meaning of this term was a factual issue, and explained that claim interpretation rests on underlying facts:

Like all legal conclusions, that conclusion [that a claim must be interpreted in a certain way] rises out of and rests on a foundation built of established (undisputed or correctly found) facts. Interpretation of a claim, or of its scope, should not be assayed until a foundation is in place. If the meaning of terms in the claim, the specification, other claims, or prosecution history is disputed, that dispute must be resolved as a question of fact before interpretation can begin.

Id. at 584, 4 U.S.P.Q.2D (BNA) at 1624. The court observed that the finding of disputed facts can "dictate" the ultimate conclusion of what the claim means:

Confusion may be caused by the circumstance in which resolution of the question of the meaning of a term or terms dictates the interpretation of the claim, but that is not unusual, legal conclusions [**120] being dictated by established facts and not the other way around, and does not change the nature of the meaning-of-terms inquiry from one of fact to one of law.

Id. The majority now criticizes and expressly overrules these statements in *Perini*, holding that these facts are not fact, but "law," and that they are removed from the trier of fact and are determined *de novo* on appeal. In my view the *Perini* court's analysis is in accord with precedent, and properly preserves the role of the trier of fact, whether trial is to the bench or to a jury.

2. Prior Art

When there is a dispute as to the meaning and scope of a technologic term or word of art in a patent claim, it is often helpful to look at the prior art: that is, what was

known to persons in the field of the invention at the time the invention was made. The scope and content of the prior art, the differences between the claimed invention and the prior art, the level of ordinary skill in the field of the invention, are all questions of fact, *Graham v. John Deere Co.*, 383 U.S. 1, 17, 148 U.S.P.Q. (BNA) 459, 467, 15 L. Ed. 2d 545, 86 S. Ct. 684 (1966), and are not subject to reclassification by us.²

2 In *Graham v. John Deere* the Court described the issue of "obviousness" in patent cases as one of law based on underlying facts. An analogous pattern has heretofore applied in connection with "claim construction", i.e., as a question of law based on underlying facts. I suggest that these ultimate questions have a strong policy component, and that the Federal Circuit's responsibility for imparting consistency to patent decisions is a significant factor in the law/fact dichotomy.

[**121] The prior art may provide evidence of how the disputed technologic terms and words of art or science were used by others in the field of the invention, and thus evidence of what was conveyed to the field by the terms as used by the patentee. Indeed, the infringement analysis can sometimes stop with the prior art, for if the accused device is found in the prior art, then it is a rule of law that the patent claims can not be interpreted to reach that device. This too requires findings of the scope and content of the prior art, a question of fact, *Graham v. John Deere*, that is found with an eye upon the accused device.

I do not attempt to catalogue the myriad kinds of information, findings, and inferences that may flow from the prior art, in determining the technologic scope of the patentee's invention. This evidence, and the findings and inferences that are drawn, are the province of the trier of fact. The majority's insistence that these are purely legal matters of "claim construction" does indeed serve to replace the trier of fact with the Federal Circuit. I doubt that it improves the quality of the decision, at great cost to efficiency of the trial/appellate process.

[**122] 3. The Prosecution History

The prosecution history is the record in the Patent and Trademark Office of what transpired during examination of the patent application. It is a public record. It sometimes is lengthy and detailed, sometimes

[**1004] sketchy and brief. The prosecution history may provide evidence of how the inventor or the patent examiner viewed the now-disputed technologic and other terms. In *Howes v. Medical Components, Inc.*, 814 F.2d 638, 645, 2 U.S.P.Q.2D (BNA) 1271, 1274-75 (Fed. Cir. 1987) this court observed that "during the prosecution of a patent, claim language may take on new meanings, possibly different from that which was originally intended." The way patentability was argued by the inventor, concessions made or positions adjusted, may be relevant to the factual issue in dispute, and may create an estoppel against the patentee's now-proposed interpretation.

The determination of what occurred in the prosecution of the patent application is a factual matter. *SmithKline Diagnostics Inc. v. Helena Lab. Corp.*, 859 F.2d 878, 882, 8 U.S.P.Q.2D (BNA) 1468, 1471-72 (Fed. Cir. 1988), specific to the particular patent. It is often based on technological arguments, experimental [**123] evidence submitted to the patent office, discussions of the meaning and relevance of prior publications and prior knowledge, explanations of the technical content of the specification, and other evidence of the applicant's and the examiner's positions. This evidence, and appropriate findings and inferences, are for the trier of fact.

The majority refers to the "undisputed" prosecution history, in asserting that there are no factual aspects to this evidence. Indeed, the official government record is fixed. But the significance of the exchanges, compromises, and explanations contained in the correspondence between the inventor and the examiner, the inferences to be drawn as to the technology, the invention, and the meaning and scope of now-disputed technologic terms or words of art: may depend on this and other evidence. If disputed, their finding is for the trier of fact. The meaning, significance, and weight of the content of a documentary record does not become a matter of law simply because the content of the record is not in dispute.

4. Technology/Scientific Facts

Decision of the question of patent infringement usually turns on findings of technologic fact; [**124] sometimes relatively simple technology, sometimes at the frontier of scientific advance and its practical applications. When scientific and technologic disputes arise in litigation, they are subject to the rules of evidence and procedure. See *Daubert v. Merrell Dow*

Pharmaceuticals, Inc., 125 F.2d 469, 113 S.Ct. 2786 (1993) (discussing issues of scientific evidence). The complexity of the technologic/scientific evidence will of course vary with the issue. See, e.g., *Brooktree Corp. v. Advanced Micro Devices, Inc.*, 977 F.2d 1555, 24 U.S.P.Q.2D (BNA) 1401 (Fed. Cir. 1992) (color video display semiconductor chips); *Scripps Clinic & Research Found. v. Genentech, Inc.*, 927 F.2d 1565, 18 U.S.P.Q.2D (BNA) 1001 (Fed. Cir. 1991) (blood clotting factor VIII); *Halliburton Co. v. Schlumberger Technology Corp.*, 925 F.2d 1435, 17 U.S.P.Q.2D (BNA) 1834 (Fed. Cir. 1991) (neutron logging of oil wells); *Bey v. Kollonitsch*, 806 F.2d 1024, 231 U.S.P.Q. (BNA) 967 (Fed. Cir. 1986) (irreversible enzyme inhibitors); *Fromson v. Advance Offset Plate, Inc.*, 755 F.2d 1549, 225 U.S.P.Q. (BNA) 26 (Fed. Cir. 1985) (silicated lithography plates).

The Court stressed in *Daubert* that the admissibility of scientific evidence depends on its reliability [**125] and relevance, and that the judge's responsibility, when the trier of fact is a jury, is to assure the adequacy of the methodology upon which the evidence is based. 113 S.Ct. at 2795-96. This emphasis on methodology is as well suited to practical applications of technology and engineering as to basic scientific principles. Evidence in patent cases is often provided by scientists or engineers as expert witnesses, and may include explanations of the technology and its scientific basis, comparisons with the prior art or with the accused device, experiments, demonstrations, and interpretations. The evaluation of technologic evidence is often required of the trier of fact. See Lee Loevinger, *Science as Evidence*, 35 *Jurimetrics J.* 153 (1995); Jack B. Weinstein, *The Effect of Daubert on the Work of Federal Trial Judges*, 2 *Shepard's Expert and Scientific Evidence Quarterly* 1 (1994).

Nor is it rare in patent cases to encounter incomplete data, theoretical uncertainties, untested inferences, and speculative conclusions. [**1005] Experimental procedures, the sources of data, and the bases of opinions that are offered to prove/disprove a technologic fact are often in evidentiary conflict [**126] in patent disputes. Engineers and scientists know very well the uncertainties of the experimental process, the fluctuations and glitches in the data, the human and machine error, the forks in the road to objective truth. Indeed, understanding of the fallibility of technologic and scientific experimentation is soon acquired by those who labor in the field of litigation. "The community of trial lawyers and judges

knows perhaps better than any other professional group just how untidy science often is in practice." Sheila Jasanoff, *What Judges Should Know About the Sociology of Science*, 77 *Judicature* 77, 80 (1993) (discussing the "social dimension [that] gives legitimacy to particular scientific 'facts'").

Now that the Federal Circuit holds that resolution of disputes as to the meaning and scope of technologic terms and words of art as used in a particular patent is law, not fact, removing the jury from this issue, is the trial judge excused from determining the admissibility and relevance of technologic evidence? What about the requirement that "credibility determinations, the weighing of the evidence, and the drawing of legitimate inferences from the facts are jury functions, [**127] not those of a judge." *Anderson v. Liberty Lobby, Inc.*, 477 U.S. 242, 255, 91 L.Ed. 2d 202, 106 S.Ct. 2505 (1986). In a patent case the trier of fact may receive extensive evidence related to the meaning and scope of technologic or scientific terms or words of art, their usage and their perception in the field of a particular invention. The evidence often includes technical publications, scientific articles, experimental data, demonstrations, and opinion testimony. The factual nature of such evidence can not be squared with the majority's criticism of such cases as *Patumbo v. Don-Joy*, 762 F.2d 969, 226 U.S.P.Q. (BNA) 5 (Fed. Cir. 1985), which is today overruled for its holding that "when the meaning of a term in a claim is disputed and extrinsic evidence is necessary to explain that term, then an underlying factual question arises." *Id.* at 974, 226 U.S.P.Q. (BNA) at 8. In addition to my concern about how a record will be developed for the Federal Circuit's de novo decision, I doubt that an appellate court's de novo finding of technologic facts is more likely to attain accuracy, than the decision of a jury or judge before whom a full trial was had:

Duplication of the trial judge's efforts in the court of appeals [**128] would very likely contribute only negligibly to the accuracy of fact determination at a huge cost in diversion of judicial resources.

Anderson v. City of Bessemer City, 470 U.S. 564, 574-75, 84 L.Ed. 2d 518, 105 S.Ct. 1504 (1985).

5. The Testimony of Experts

Disputed questions of the meaning and scope of

technologic terms and words of art are decided from the viewpoint of persons of skill in the specific field of technology. It is rare to come upon a technologic issue in litigation for which differing and often plausible views are not offered by qualified witnesses. The Federal Rules of Evidence contemplate the provision of specialized knowledge to assist the trier of fact:

R. 702 If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto

In *Moeller v. Ionetics, Inc.*, 794 F.2d 653, 229 U.S.P.Q. (BNA) 992 (Fed. Cir. 1986) this court held that the trial court's rejection of expert testimony in that case was an abuse of discretion:

Although use of experts is generally [*129] a matter of discretion with the trial judge, that discretion is not unlimited. In a patent case involving complex scientific principles, it is particularly helpful to see how those skilled in the art would interpret the claim.

Id. at 657, 229 U.S.P.Q. (BNA) at 995 (citations omitted). In *Moeller* the claims related to an electronic process for measuring the concentration of cations, the dispute centering on the particular meaning of the term "electrode body." *Moeller* too is now criticized and overruled for its statement that

although claim construction is a legal question, underlying fact disputes may arise [*1006] pertaining to extrinsic evidence that might preclude summary judgment treatment of claim construction.

Id. (citation omitted). I do not see how the Federal Circuit could have decided, de novo on appeal, the meaning of "electrode body" in this particular invention without finding disputed technologic facts.

The majority's stated recognition that expert testimony may be useful, while holding that "extrinsic evidence of record cannot be relied on to change the meaning of the claims," majority op. at 26, denying all deference to the trier of fact's [*130] findings based on

that evidence, illustrate the confusion in the court's plan of de novo claim interpretation as a matter of law. The majority has created a procedural quandary, for extrinsic evidence can apparently be received, but no jury can weigh it. When the extrinsic evidence is in conflict—as it invariably is—what then? Will the Federal Circuit itself weigh the evidence of expert witnesses? Will we receive a collection of self-serving affidavits, without examination and cross-examination? Such a procedure surely is not optimal for cases that may require decision of complex engineering or electronics, or chemical or biological processes.

The Court in *Daubert* referred to the value of the adversary system in matters of scientific proof. The cross-examination of technical experts, with the adversarial guidance of other technical experts, can be as rigorous as any "peer review" process. See generally Margaret A. Berger, *Procedural Paradigms for Applying the Daubert Test*, 78 Minn. L. Rev. 1345 (1994). In resolving litigation controversy by determining mechanical or chemical or electronic truth, it is hard to understand why justice should be handicapped in the [*131] Federal Circuit by replacement of a live trial with cold documents.

In eliminating all sources of "fact" that might implicate the jury right, the majority has denied to the trial of patent cases the assistance that *Federal Rule of Evidence* 702 is designed to provide, as well as the benefits of Rules 403, 703, and 706. The purpose of these rules is "that the truth may be ascertained and proceedings justly determined." *Fed. R. Evid.* 102. It seems to me that we have constructed a Hobson's choice whereby either (1) there will indeed be factual evidence of technologic meaning entered into the trial record, for de novo decision on the record by the Federal Circuit, (2) there will be scant evidence admitted at trial, in view of our pronouncement that there is only law in claim interpretation. Either way, one might call this the "omniscience of the learned man" theory of dispute resolution in the Federal Circuit.³

3 Nathan Isaacs, *The Law and the Facts*, 22 Colum. L. Rev. 1, 13 (1922) (warning courts of "medieval assumptions as to the omniscience of the learned man").

[**132] Findings of the meaning of technologic terms and words of art in particular usages are the province of the trier of fact. Discussing words and their

jurisprudential treatment, Justice Holmes wrote:

A word is not a crystal, transparent and unchanged; it is the skin of a living thought and may vary greatly in color and content according to the circumstances and the time in which it is used.

Towne v. Eisner, 245 U.S. 418, 425, 62 L. Ed. 372, 38 S. Ct. 158 (1918). In *Autogiro Co. of America v. United States*, 181 Ct. Cl. 55, 384 F.2d 391, 397, 155 U.S.P.Q. (BNA) 697, 702 (Ct. Cl. 1967) one of our predecessor courts remarked: "The very nature of words would make a clear and unambiguous [patent] claim a rare occurrence." Justice Story explained the roles of judge and jury with respect to the meaning of "words of art, and technical phrases" in patent documents:

In respect to another objection, viz. that the court was bound to state what in point of law the invention claimed by the patentee was, I agree, that this is generally true, so far as the construction of the words of the patent, and specification is concerned. But then this doctrine is to be received with qualifications, and sub modo, as the very opinion [*133] of Mr. Baron Parke, cited by the counsel, in the case of *Neilson v. Harford*, Webster Pat. Cas. 295, 370,[⁴] abundantly shows: and the jury are to judge of [*1007] the meaning of words of art, and technical phrases, in commerce and manufactures, and of the surrounding circumstances, which may materially affect, enlarge or control the meaning of the words of the patent and specification.

4 English patent cases were cited by United States courts well into the nineteenth century.

Washburn v. Gould, 29 F. Cas. 312, 325 (C.C.D. Mass. 1844) (emphasis added). Justice Story recognized that the meaning of words of art may depend on "the surrounding circumstances." Indeed, the Federal Circuit recognized that words do not always have the same meaning when they are adapted to new uses. See *Fromson v. Advance Offset Plate, Inc.*, 720 F.2d 1565, 1569, 219 U.S.P.Q. (BNA) 1137, 1140 (Fed. Cir. 1983)

(patentee may be his own lexicographer).

Inventors' usages of words to describe their inventions, and the meaning thereby [*134] conveyed to persons skilled in the field, are questions of fact, not matters of law, in patent documents as in other written instruments. Disputes concerning the meaning and usage of technical terms and words of art arise in many areas of law. These disputes are resolved by the triers of fact, whether judge or jury, in their established roles in the adjudicatory process. For example, the role of the jury with respect to technical terms in a contract for drilling oil wells was explained in *Startex Drilling Co. v. Sohio Petroleum Co.*, 680 F.2d 412 (5th Cir. 1982):

It is more apt to say that the undefined technical terms on which the contract's application to the present dispute depends convey little meaning without explanation. So, while we agree with Sohio that we are free to determine the ambiguity question anew, we also affirm the district court's ruling that the contract is ambiguous. Thus it was proper to submit to the jury the evidence from both sides as to the meaning attached to these technical terms by the parties, and by the industry.

Id. at 415 (citation omitted). In *Zell v. American Seating Co.*, 138 F.2d 641 (2d Cir. 1943), Judge Frank wrote for [*135] the court that:

Thayer delightfully described the fatuous notion of a "lawyer's Paradise, where all words have a fixed, precisely ascertained meaning; where men may express their purposes, not only with accuracy, but with fullness; and where, if the writer has been careful, a lawyer, having a document referred to him, may sit in his chair, inspect the text, and answer all questions without raising his eyes."

Id. at 648 n.26 (quoting Thayer, A Preliminary Treatise on Evidence (1898)).

It has not heretofore been seriously challenged that findings of the weight and credibility of evidence are for the jury, whether the issues are technologic, scientific, or otherwise. See *Sartor v. Arkansas Natural Gas Corp.*, 321 U.S. 620, 88 L. Ed. 967, 64 S. Ct. 724 (1944):

[The weight and credibility of a witness' testimony] "belongs to the jury, who are presumed to be fitted for it by their natural intelligence and their practical knowledge of men and the ways of men; and so long as we have jury trials they should not be disturbed in their possession of it, except in a case of manifest and extreme abuse of their function."

Id. at 628 (quoting *Aetna Life Ins. Co. v. Ward*, 140 [**136] U.S. 76, 88, 35 L. Ed. 371, 11 S. Ct. 720 (1891)). In *Railroad Dynamics, Inc. v. A. Stucki Co.*, 727 F.2d 1506, 220 U.S.P.Q. (BNA) 929 (Fed. Cir.), cert. denied, 469 U.S. 871, 83 L. Ed. 2d 150, 105 S. Ct. 220 (1984) this court instructed a party who sought de novo appellate review after a jury trial:

Thus [Railroad Dynamics] misconceives our role as an appellate court. In the concert hall of justice, each musician has a part to play. When one on whom plays not his own but another's part, discord is certain. Moreover, our parts are played under well defined rules.

Id. at 1514, 220 U.S.P.Q. (BNA) at 937.

Implementing this court's departure from the established appellate role, in reviewing Markman's case on this appeal the majority does not mention the jury instructions, or discuss whether a reasonable jury could have reached the verdict that was reached on the evidence adduced, or decide whether there was substantial credible evidence of such content and weight as could support the jury's verdict. The majority finds for itself [*1008] the disputed fact of whether the term "inventory" includes the invoices of the Westview system, without any deference to the trial process. Whether or not this court believes that it is a superior finder of technologic [*137] fact, that is not our place in the judicial structure.

I wonder how this new system will work. The majority states that the trial judge should have decided the meaning of "inventory" before giving the case to the jury,⁵ but that the error was harmless since the trial judge reached the correct meaning "as a matter of law" after the jury verdict. There was no return to the jury after the trial judge re-decided what "inventory" meant, making the jury superfluous. The Federal Circuit now decides de

novo whether "inventory" includes "invoices," ignoring the trial. What of the trial process, if trial judge and jury are ciphers upon appellate review? In the Introduction to the Reference Manual on Scientific Evidence (1994), Judge Schwarzer wrote:

5 Attempting to understand how this procedure would work for complex technologies, at the en banc argument I inquired of Westview's counsel:

J. Newman: If the claim is sufficiently complex -- technologically or just complex in general -- that the judge can't decide what it means without taking testimony, hearing the experts, hearing the inventor, hearing whatever else it is that each side needs to, wants to, adduce that the judge permits . . . I can envision, can't you, that a judge would have to hold some kind of evidentiary hearing, at least, if not a mini-trial, in order to learn enough about the claim to decide, as a matter of law, disputed issues?

Mr. Griffin: Yes your honor.

J. Newman: We are assuming the issues are disputed, that this is not just a matter of explanation, but a matter of requiring a choice between one side's viewpoint and another. And that the judge should then have a preliminary trial to decide what the claim means by making whatever choices need to be made, and then tell the jury: "Take it from here now, apply this to the accused device"

Mr. Griffin: Yes your honor.

J. Newman: That is quite unusual, is it not? Have you seen this done?

Mr. Griffin: Personally no your honor.

J. Newman: I wonder how the trial judges would take to that.

Mr. Griffin: Probably would not like it your honor, because that would impose a burden which in most cases can be avoided.

[**138]

The bedrock of [the justice] system is the adversary process, which depends on

attorneys to present evidence on behalf of their clients, judges to make the necessary and appropriate rulings concerning admissibility, and juries to resolve disputed issues of fact.

Id. at 1.

In patent cases, no less than for other causes of action, it is the trier of fact on whom the system of justice is founded. The extensive exposition of disputed facts that is available at trial can not be duplicated on appeal. Even were there no constitutional infirmity, I can discern no practical benefit sufficient to justify this court's departure from the established procedures of trial and appeal. Implicit in the appellate process is an expected degree of deference to the trial process. The majority's elimination of the jury as trier of fact, and elimination of the deference owed to the judge upon bench trial of disputed facts, removes from the parties the benefit of the trial process. It distorts the trial/appellate relationship in a manner unique to patent litigation, and manifests a heady misperception of our assignment as a national appellate court.

*C. THE "CLASSIFICATION POWER" [**139] -- TURNING FACT INTO LAW*

Commentators have remarked on the temptation of appellate courts to redefine questions of fact as questions of law in order to impose the court's policy viewpoint on the decision. Professor Martin Louis calls the appellate assertion of power to treat fact as law "drastic in that it amounts to a direct judicial assault on the prerogatives of fact finders." Martin B. Louis, *Allocating Adjudicative Decision Making Authority Between the Trial and Appellate Levels: A Unified View of the Scope of Review, the Judge/Jury Question, and Procedural Discretion*, 64 N.C. L. Rev. 993, 1018 (1986). Louis observes that the "classification of ultimate facts as questions of law amounts to a manipulation of the law-fact doctrine to take questions from the jury or to subject the trial level's resolution of questions to free appellate review." *Id.* at 1028. Although the *Seventh Amendment* has provided a safeguard [*1009] against this autocracy of the judiciary, concerned observers have long counselled vigilance. Thus definitions of fact and law--the methodology of this appellate power--have attracted the attention of legal scholars.

"Law" is usually defined as a statement [*140] of

the general principle or rule, predicated in advance, awaiting application to particular facts as they may arise. See Francis H. Bohlen, *Mixed Questions of Law and Fact*, 72 U. Pa. L. Rev. 111, 112 (1924). *Louis, supra*, at 994, states the principle:

Declarations of law are fact-free general principles that are applicable to all, or at least to many, disputes and not simply to the one sub judge.

There is an additional element to "law;" that is, the duty of judicial enforcement. As Professor Thayer explained, "nothing is law that is not a rule or standard which it is the duty of judicial tribunals to apply and enforce." James B. Thayer, "Law and Fact" in *Jury Trials*, 4 Harv. L. Rev. 147, 153 (1890).

Thayer defines "fact" as follows:

"[Fact]" is what Locke expresses when he speaks of "some particular existence, or, as it is usually termed, matter of fact." The fundamental conception is that of a thing as existing, or being true. It is not limited to what is tangible, or visible, or in any way the object of sense; things invisible, mere thoughts, intentions, fancies of the mind, propositions, when conceived of as existing or being true, are [*141] conceived of as facts. The question of whether a thing be a fact or not, is the question of whether it is, whether it exists, whether it be true. All inquiries into the truth, the reality, the actuality of things are inquiries into the fact about them.

Id. at 151-52. A compilation of definitions of "fact" is provided in *Black's Law Dictionary* 591-92 (6th ed. 1990):

A thing done; an action performed or an incident transpiring; an event or circumstance; an actual occurrence; an actual happening in time or space or an event mental or physical; that which has taken place.

....

... "Fact" means reality of events or things the actual occurrence or existence of which is to be determined by evidence.

In sum, the law is a general proposition, while the fact is a case-specific inquiry. Clarence Morris, *Law and Fact*, 55 Harv. L. Rev. 1303, 1304 (1942), observed that a controlling distinction between law and fact is whether evidence is needed, for a question of fact usually calls for proof, whereas matters of law are established not by evidentiary showing but by intellectual abstraction.

These distinctions have often been discussed. [**142] usually in the course of considering the complexities that can arise, and how they have been, or should be, treated. Thus commentators and judges have written to explain the distinctions among historical facts, ultimate facts, and mixed law/fact questions, in the course of relating these distinctions to trial procedures and judicial review. The nicety that has been generated was criticized in *Armour & Co. v. Wilson & Co.*, 274 F.2d 143, 124 U.S.P.Q. (BNA) 115 (7th Cir. 1960), as follows:

We have come to speak of questions of "fact," "primary facts," "subsidiary facts," "evidentiary facts," "ultimate facts," "physical facts," "documentary facts," "oral evidence," "inferences," "reasonable inferences," "findings of fact," "conclusions," "conclusions of law," "questions of fact," "questions of law," "mixed questions of law and fact," "correct criteria of law," and so on ad infinitum. The simple answer is that we are all too frequently dealing in semantics, and our choice of words does not always reflect the magic we would prefer to ascribe to them.

274 F.2d at 155, 124 U.S.P.Q. (BNA) at 124-25 (footnote omitted). See generally Steven A. Childress & Martha S. Davis, *Federal Standards* [**143] of Review (2d ed. 1992).

The character of what is a fact does not change, even in those special cases that have been held to warrant plenary appellate review.⁶ The subject matter that the majority [*1010] now designates as "law"—the disputed meaning and scope of technologic terms and words of art as used in particular inventions—is not law, but fact. On

any definition of fact and law, the question of whether "inventory" as used in Markman's Claim 1 means only clothing or can include invoices is a question of fact: on Thayer's criterion of whether the fact exists; on Morris' criterion of whether there is a need for evidence; on Bohlen's inquiry of whether the meaning is specific to the situation sub judice. The meaning of "inventory" is specific to this invention, this patent, this claim, this system, this defendant. Its determination is for the trier of fact.

6 Among the rare exceptions to deferential appellate review of factual findings are the "constitutional facts", discussed in *Bose Corp. v. Consumers Union of United States, Inc.*, 466 U.S. 485, 80 L. Ed. 2d 502, 104 S. Ct. 1949 (1984). In *Bose* the Court cautioned against enlarging its holding beyond the conflict between constitutional provisions there exemplified. The "constitutional fact" exemplified in *Bose* does not place all facts in the hands of appellate courts for de novo finding. Such exceptions to the otherwise firm rule of deference to the trier of fact have always been narrow. See generally Frank R. Strong, *Dilemmic Aspects of the Doctrine of "Constitutional Fact"*, 47 N.C. L. Rev. 311 (1969).

[**144] III

THE CONSTITUTION

The most egregious lapse in the majority's ruling is its discard of the jury right in patent cases. As I said at the outset, patent infringement has been tried to a jury in the United States for two hundred years, and in England since at least 1623. Disputes concerning "letters patent" for inventions were tried in the English courts, as for other forms of letters patent, as I shall illustrate. Patent infringement trials at common law included determination of validity as well as infringement. Whatever version of "law/fact" this court now chooses to adopt, it can not redact the history of jury trials. The judicial obligation to safeguard the constitutional right is not defeasible by calling a patent a "statute," or otherwise diminishing the vitality of the *Seventh Amendment*.

Thus the court, sitting en banc to overrule its contrary precedent, removes the jury from its role as the trier of fact. That right is assured by the *Seventh Amendment*:

In Suits at common law, where the value in controversy shall exceed twenty dollars, the right of trial by jury shall be preserved, and no fact tried by a jury shall be otherwise re-examined in any [**145] Court of the United States, than according to the rules of the common law.

U.S. Const. amend. VII.

The importance of the jury right to the Framers can not be overemphasized. Alexander Hamilton wrote:

The friends and adversaries of the plan of the convention, if they agree in nothing else, concur at least in the value they set upon the trial by jury: or if there is any difference between them it consists in this: the former regard it as a valuable safeguard to liberty: the latter represent it as the very palladium of free government.

The Federalist No. 83, at 499 (Clinton Rossiter ed., 1961). In discussing the history of the jury in England and in the United States, Judge Arnold has explained:

It is almost impossible to exaggerate the centrality of the institution of the jury to almost all the important episodes of Anglo-American legal history. Many of the central ideas of the American and English common law owe their origin to the fact that the jury was the chief mechanism for trying factual disputes. It is the single most important institution in the history of Anglo-American law.

Morris Sheppard Arnold, The Civil Jury in Historical Perspective [**146] , in The American Civil Jury 9, 10 (1987).

The value that the Framers placed on this "palladium of free government" has been guarded by the courts:

Maintenance of the jury as a fact-finding body is of such importance and occupies so firm a place in our history and jurisprudence that any seeming curtailment of the right to a jury trial should be scrutinized with the utmost care.

Dimick v. Schiedt, 293 U.S. 474, 486, 79 L. Ed. 603, 55 S. Ct. 296 (1935).

The deference that courts give to jury verdicts is the mechanism by which the Constitution protects the jury right from encroachment by judges. It is not this court's [**1011] option to violate that right, whether by denying such deference or by taking from the jury the trial of factual issues. Whatever one's personal view of the relative capabilities of a jury and the Federal Circuit in finding technologic facts in patent cases, it is not within our authority to readjust that role to our taste:

The *Seventh Amendment* . . . requires that questions of fact in common law actions shall be settled by a jury, and that the court shall not assume directly or indirectly to take from the jury or to itself such prerogative.

Walker v. New Mexico [**147] & *So. Pac. R. Co.*, 165 U.S. 593, 596, 41 L. Ed. 837, 17 S. Ct. 421 (1897). The Federal Circuit early affirmed its inheritance of this responsibility, as we undertook our assignment to provide nationwide uniformity in patent cases. In *Connell v. Sears, Roebuck & Co.*, 722 F.2d 1542, 1547, 220 U.S.P.Q. (BNA) 193, 197 (Fed. Cir. 1983) the court stated:

So long as the *Seventh Amendment* stands, the right to a jury trial should not be rationed, nor should particular issues in particular types of cases be treated differently from similar issues in other types of cases.

In *Railroad Dynamics v. Stucki*, 727 F.2d at 1515, 220 U.S.P.Q. (BNA) at 937, the court stated:

There is, of course, no reason for considering patent cases as somehow out of the mainstream of the law and rules of procedure applicable to jury trials for centuries under our jurisprudence.

In many ensuing decisions we reaffirmed this obligation. However, this court's fidelity to fundamental law slipped in recent years, culminating in today's trivializing of our heritage as we defeat the jury right in patent infringement cases.

A. THE HISTORICAL TEST

There are no fine lines to be drawn in interpreting the *Seventh Amendment*, [*148] for all cases at common law in England were tried to a jury. In explaining the "historical test," Justice Story described England as "the grand reservoir of all our jurisprudence":

Beyond all question, the common law here alluded to [in the *Seventh Amendment*] is not the common law of any individual state, (for it probably differs in all), but is the common law of England, the grand reservoir of all our jurisprudence. It cannot be necessary for me to expound the grounds for this opinion, because they must be obvious to every person acquainted with the history of the law.

United States v. Womson, 1 Gall. 5, 28 F. Cas. 745, 750 (1812). The historical test assured the largeness of the embrace of the Amendment. I can find no support in history for the restriction today adopted. In England in 1791, as of at least 1623, actions of the "force and validity" of letters patent were tried according to the rules of the common law.

Letters patent were grants of the Crown, made for a variety of purposes. During the 1500s to early 1600s, the Star Chamber considered all infringements of letters patent to be contempts of royal authority. See *Millar v. Taylor*, 4 Burr. 2303, 2374 (K.B. [*149] 1769) (contempt proceeding applied by the Star Chamber to infringement of "any patent the Crown thought proper to grant"); Coke, 3 Inst. 182-83 (discussing abuses). In 1623 the Statute of Monopolies prohibited all monopolies except patents for inventions, which continued to be granted for terms that were limited to fourteen years. Section 6 of the Statute stated:

6. Provided also, that any declaration before mentioned, shall not extend to any letters patents and grants of privilege for the term of fourteen years or under, hereafter to be made, of the sole working or making of any manner of new manufactures within this realm to the true and first inventor and inventors of such manufactures, which others at the time of

making such letters patents and grants shall not use, so as also they be not contrary to the law nor mischievous to the state by raising prices of commodities at home, or hurt of trade, or generally inconvenient . . .

21 Jac. I, c.3, s.6 (1623).⁷ Section 2 of the Statute provided that the "force and validity" [*1012] of the subject matter of the Statute shall be "examined, heard, tried, and determined" according to the common law:

7 The date of the Statute of Monopolies is variously reported as 1623 or 1624 depending on whether the old or new English calendar is used. Edward C. Walterscheid, *The Early Evolution of the United States Patent Law: Antecedents* (Part 2), 76 J. Pat. & Trademark Off. Soc'y 849, 873 n.98 (1994).

[*150]

2. And all monopolies, and all such commissions, grants, licenses, charters, letters patent, proclamations, inhibitions, restraints, warrants of assistance, and all other matters and things tending as aforesaid, and the force and validity of them, and every of them, ought to be, and shall be for ever hereafter examined, heard, tried, and determined, by and according to the common laws of this realm, and not otherwise.

21 Jac. I, c.3, s.2 (1623). Lord Coke explained that the purpose of Section 2 was to remedy the "mischief" of Star Chamber actions by placing the authorized grants under the common law. 3 Inst. at 183.

The litigation procedures that applied to letters patent for inventions did not differ from those applied to other letters patent. See Benjamin Vaughan Abbott, *Decisions on the Law of Patents for Inventions Rendered by English Courts* 8 n.2 (1887) (the rules for letters patent stated in the case of *Rex v. Mussey* (K.B. 1738) were also generally applicable to letters patent for inventions). English cases of the period show similar procedures whether the subject was a charter, an invention, a literary work, a trademark, an interest in land, or [*151] a trade route.

Trial by jury was the way of the common law, and did not depend on the subject of the letters patent. See, e.g., *East India Company versus Sandys*, 1 Vern. 127 (Ch. 1682) (validity of grant of exclusive trade route tried to jury); *Mayor of Kingston upon Hull versus Horner*, 1 Cowp. 102, 108 (K.B. 1774) (dispute concerning meaning of terms of a charter from the Crown relating to a port "most proper to be left to the decision of the jury"); *Blanchard v. Hill*, 2 Atk. [2d ed. 1794] 484 (Ch. 1742) (injunction to restrain the use of a tradesman's mark granted by the Crown could not be issued without a hearing at law); *Anon*, 1 Vern. 120 (Ch. 1682) (the Lord Keeper (or Chancellor) required trial at law to determine the validity of letters patent for printing of the Bible); *Collins v. Sawrey*, 4 Bro. P.C. [2d ed. 1803] 692 (H.L. 1772) (rejecting argument that since the issue depended on written evidence, the "construction" of the letters patent for a vicarage was for the chancery court); *Donaldson v. Beckett*, 2 Bro. P.C. [2d ed. 1803] 129, 138 (H.L. 1774) ("Between such inventions and copies of books, no sensible distinction can be drawn."); [**152] *Millar v. Taylor*, 4 Burr. at 2323:

In letters patent, all conditions required by 21 Jac. 1 must be observed. Patentees for new inventions are left by that statute to the common law, and the remedies which follow in their nature.

There simply is no way, in 1995, to rewrite the history of England and the place of the jury under the common law in 1791.

Actions for infringement of letters patent for inventions were initiated either in the law courts or in Chancery, depending on the relief sought.⁸ When equitable relief was sought, patent actions began with the filing of a bill in the Ordinary side of Chancery (called the Petty Bag or Latin Side), for that [**1013] is where the letters patent were "enrolled." Issues relating to validity and noninfringement, if raised by the defendant, were directed by the Chancellor to the courts of law for trial to a jury, and then returned to Chancery if the verdict warranted. The procedure of filing a bill in Chancery and then trying the issue at law was explained by Davies:

⁸ There were two courts in Chancery, the Ordinary court and the Extraordinary court. The Extraordinary side of Chancery was so termed

because matters requiring the exercise of the King's Conscience were there addressed, for extraordinary relief. Abridgment at 127; Coke, 4 Inst. at 79. The Ordinary side of Chancery has been referred to as "common-law chancery," see *Kirker v. Owings*, 98 F. 499, 506 (6th Cir. 1899), and proceeded according to the laws and statutes of England, exercising the ordinary powers of Chancery. Middle Temple. General Abridgment of Cases in Equity 127 (1739) ("Abridgment"); Coke, 4 Inst. at 79.

The Ordinary court had the power to repeal letters patent, by plea of *scire facias*. However, if the matter "descended to issue" the court was without jurisdiction to try it to a jury, and the Chancellor would direct the issue to a court of law, where the issue would be tried to a jury. "because for that Purpose both Courts are but one." Abridgment at 128; see Coke, 4 Inst. at 80. After trial, with jury verdict rendered, the cause was returned to Chancery for further disposition consistent with the verdict. Abridgment at 130 ("A Cause shall not be examined upon Equity in the Court of Requests, Chancery, or other Court of Equity, after Judgment at the Common Law.")

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The Court of Chancery never decides upon the validity of a patent, the practice there being nothing more than to grant an injunction, at the prayer of the patentee, against any person infringing his patent, and to order an account of profits; but if any question arises upon the validity of the patent, novelty of the invention, or the sufficiency of the specification, it is uniformly referred to a court of law.

John Davies, A Collection of the Most Important Cases Respecting Patents of Invention and the Rights of Patentees ix (1816).

In infringement suits, the Chancery court could grant the patentee's bill seeking an injunction, or a writ of *scire facias* to repeal the patent, after trial to a jury in a court of law. See, e.g., *Brewster v. Weld*, 6 Mod. 229 (1704) (a *scire facias* to repeal letters patent may be sued in Chancery by any person prejudiced by a patent, as well as

by the Crown; when Chancery issues writ returnable to Queen's Bench [requiring trial to a jury] Chancery neither has jurisdiction nor can it supersede such writ; *Rex v. Elsc*, 1 Carp. P.C. 103 (K.B., N.P. 1785) (proceeding brought by writ of scire facias to repeal [**154] patent on ground that there was no new invention described in the specification; tried in King's Bench wherein the jury rendered a verdict for the Crown). Not all matters required the Chancellor to direct issues to the law courts to be tried. For example, when the Crown granted letters patent, for invention or otherwise, the grant had to be enrolled in Chancery's Petty Bag Office within four months for the patent to be enforceable. Thus a bill could be filed in Chancery to seek equitable relief for a patentee's failure to enroll the patent before the time expired. E.g., *Ex parte Beck*, 1 Bro. P.C. [2d ed. 1803] 578 (Ch. 1784).

These relationships were well established by the date of the *Seventh Amendment*. Issues of patent infringement and validity were tried only to a jury, in the courts of King's Bench, Common Pleas, or Assize. In a common procedure the patentee would seek an injunction against infringement, the defendant would assert invalidity, and the matter would be directed to a court of law for trial. This process is illustrated in *Newsam v. Gray*, a patent infringement action that started with a bill in equity, seeking to enjoin Gray, the alleged infringer. The [**155] Lord Keeper directed the plaintiff to bring an action at law. The following is from Lord Chancellor Hardwicke's opinion in the subsequent proceeding in Chancery, where Gray was seeking to recover costs since the plaintiff was nonsuited for failure to prosecute:

The plaintiff had obtained letters patent of the crown for a new invention of fire engines.

A bill was brought by him to establish his letters patent, and for a perpetual injunction against the defendant, who had taken upon him to make and vend these engines, notwithstanding the plaintiff had sole right and property under the letters patent.

The defendant, by his answer, insisted it was not a new invention, so as to entitle the plaintiff to an injunction.

There was no replication, but the cause came on at the Rolls, upon bill and answer, in *September 1740*, before Mr. Justice *Parker*, who, not thinking the answer sufficient, directed an action at law to be brought by the plaintiff, for a breach of the letters patent, and retained the bill for a twelvemonth; the plaintiff was nonsuited at law upon the merits; and the cause is now set down by the defendant for a dismission of the bill, [**156] and for costs.

2 Atk. [2d ed. 1794] 286, 286-87 (Ch. 1742).

When the patentee did not seek equitable relief, the action was brought directly at law. The cause of action was trespass on the case. The action was an offspring of the criminal law, and knew no form but trial by jury. See H.G. Hanbury and D.C.M. Yardley, *English Courts of Law* 64 (5th ed. 1979) (1944). The defendant could assert defenses including invalidity [**1014] and noninfringement. All issues, including damages, were for the jury.

The burden of proof was on the patentee. Since letters patent of invention were issued without examination, simply upon declaration, actions to enforce the patent began with proof of entitlement to the patent, if disputed by the defendant. The burden of proving infringement was also on the plaintiff, if infringement was disputed. The English reports show that often patent infringement actions turned on the issue of entitlement or validity, whereupon when validity was found, verdict would be rendered for infringement. For example, *Dolland's Case*, 1 Carp. P.C. 28 (C.P. 1766) ⁹ was an action for trespass on the case, seeking damages resulting from infringement of *Dolland's 1758* [**157] patent on a telescope. The defendant asserted invalidity due to prior use. The jury verdict was for *Dolland*.

⁹ *Carpmael* lists the date of the decision as 1758, and *Abbott*, *supra*, at ⁹, states the date as 1766. The date of the patent grant is 1758, suggesting that *Abbott* may be correct. There is no official report of *Dolland's Case*, but the decision is discussed in *Boulton v. Bull*, 2 H. Bl. 463, 482-87 (K.B. 1795).

Morris v. Bramson, 1 Carp. P.C. 30 (K.B. 1776) was an action for infringement of *Morris's* patent, a patent

previously tried and adjudged valid and infringed in *Morris v. Elsc.* (*Morris v. Elsc.* is unreported in the *English Reports*; the case is discussed in *Boulton v. Bull*, 2 H. Bl. at 489.) In *Morris v. Bramson* the defendant argued that an addition to an old machine was not patentable as a matter of law. The judge instructed the jury on the law, and the jury found for the plaintiff, awarding 500 pounds in damages for infringement. 1 *Carp. P.C.* at 31.

Bramah v. Hardcastle [**158] , 1 *Carp. P.C.* 168 (K.B. 1789), was an action in trespass on the case for infringement of letters patent for a new construct of a water closet. The defendant asserted invalidity due to prior use and lack of novelty. Lord Kenyon is reported as telling the jury "the patent was void, the invention not being new," *id.* at 171, and that they should find for the defendant.¹⁰ The jury sustained the patent, and found infringement. The court entered judgment in accordance with the jury verdict.

¹⁰ *Hanbury*, *supra*, at 87-88, explains that the court was not instructing the jury on what verdict it must render. The practice was for the judge to summarize the evidence and the testimony, and frequently provide a "hint" to the jury. However, this did not diminish the authority of the jury to decide the matter.

Arkwright v. Nightingale, 1 *Carp. P.C.* 38 (C.P. 1785), was an action for infringement of a 1775 letters patent for "machines of utility in preparing silk, cotton, flax and wool for spinning." At trial the defendant [**159] claimed that the patent was invalid because of an inadequate disclosure in the specification. At the close of the trial, Lord Loughborough provided a lengthy summary of the evidence, and concluded his charge with: "Therefore the single question is, whether you believe these five witnesses are perjured, or that they speak the truth. According as you are of the opinion, one way or the other, you will find your verdict for the plaintiff or the defendant." 1 *Carp. P.C.* at 53. The jury rendered a verdict for the plaintiff, that is, infringement by the defendant.

Rex v. Arkwright, 1 *Car. P.C.* 53 (K.B. 1785): After the decision in *Arkwright v. Nightingale*, *supra*, a scire facias was filed with the High Court of Chancery to repeal the patent from the rolls, the petitioner asserting in part that the invention was not new as to use in England, and that *Arkwright* was not the inventor. The issue was

tried to a jury in King's Bench. After the close of the evidence, the court instructed the jury:

Gentlemen, thus the case stands as to the several component parts of this machine; and if upon them you are satisfied none of them were inventions unknown at the time this patent [**160] was granted, or that they were not invented by the defendant; upon either of these points the prosecutor is entitled to your verdict.

1 *Car. P.C.* at 101. The jury found for the prosecutor.

Turner v. Winter, 1 T.R. 602 (K.B. 1787), reports a ruling on a motion to set aside a jury verdict of patent infringement and grant [**1015] a new trial. The court granted the motion, explaining that:

And if it appear that there is any unnecessary ambiguity affectively introduced into the specification, or anything which tends to mislead the public, in that case the patent is void. Here it does appear to me, that there is at least such a doubt on the evidence, that I cannot say this matter has been so fully and fairly examined, as to preclude any further investigation of the subject.

1 T.R. at 605. The case was remanded for a new trial.

Administrators of Calthorp v. Waymans, 3 *Keb.* 710 (K.B. 1676) was an action for infringement of a patent on an engine. The jury was instructed that English law required novelty only in England, and did not require that an importer/patentee of a device new to England be the actual inventor. The jury found for the patentee, the report of the [**161] case explaining that "it appeared in evidence to a jury at Bar, that the fashion came out of Holland, and was there used above fifty years since, but never before used in England." 3 *Keb.* at 710.

I again stress that actions at law were tried to a jury. With respect to letters patent for inventions, and in accordance with the Statute of Monopolies, in seventeenth- and eighteenth-century England patent infringement was tried to a jury at common law. I have come upon no exception in the cases reported during this period.

B. CONTINUITY IN THE UNITED STATES

The reports of English patent cases do not manifest the turmoil in preserving the jury right in England, the imprisonment of jurors before 1670, and attempts to limit the jury right in England as well as in the American colonies. Reflecting this experience, there was in the new United States a reverence for the place of the jury as, in the words of Thomas Jefferson, "the only anchor yet imagined by man, by which a government can be held to the principles of its constitution." *Parklane Hosiery Co. v. Shore*, 439 U.S. 322, 343 n.10, 58 L. Ed. 2d 552, 99 S. Ct. 645 (1979) (Rehnquist, J., dissenting) (quoting 3 The Writings of Thomas Jefferson 71 (Washington [**162] ed. 1861)).

The Supreme Court summarized a long history in the statement:

The trial by jury is justly dear to the American people. It has always been an object of deep interest and solicitude, and every encroachment upon it has been watched with great jealousy.

Parsons v. Bedford, 28 U.S. (3 Pet.) 433, 445, 7 L. Ed. 732 (1830). Justice Story made clear that the right was not limited to the precise causes of action that existed in the law courts of England. *Id.* at 446-47. See generally James Fleming, Jr., *Right to a Jury Trial in Civil Actions*, 72 Yale L.J. 655 (1963). In *Curtis v. Loether*, 415 U.S. 189, 39 L. Ed. 2d 260, 94 S. Ct. 1005 (1974) the Court wrote:

Although the thrust of the Amendment was to preserve the right to jury trial as it existed in 1791, it has long been settled that the right extends beyond the common-law forms of action recognized at that time.

415 U.S. at 193. In *Tull v. United States*, 481 U.S. 412, 417, 95 L. Ed. 2d 365, 107 S. Ct. 1831 (1987) the Court reiterated that the right to jury trial extends to causes of action created by Congress which are similar to common law forms of action. As a recent example, in *Chauffeurs, Teamsters, and Helpers Local No. 391 v. Terry*, 494 U.S. 558, 108 L. Ed. 2d 519, 110 S. Ct. 1339 [**163] (1990), the Court considered whether a suit in which an employee sought back pay, for breach of a union's duty of fair representation, carried the right to a jury trial. The

Court stated:

To determine whether a particular action will resolve legal rights, we examine both the nature of the issues involved and the remedy sought. "First, we compare the statutory action to 18th-century actions brought in the courts of England prior to the merger of the courts of law and equity. Second, we examine the remedy sought and determine whether it is legal or equitable in nature." *Tull*, *supra*, at 417-18 (citations omitted). The second inquiry is the more important [**1016] in our analysis. *Granfinanciera, S. A. v. Nordberg*, 492 U.S. 33, 42, 106 L. Ed. 2d 26, 109 S. Ct. 2782 (1989).

494 U.S. at 565 (footnote omitted). Observing that the cause of action of a union's duty was unknown in eighteenth-century England, the Court looked to analogous actions, including an action to set aside an arbitration award, an action of a beneficiary against a trustee, and an attorney malpractice action. *Id.* at 555-56. The Court held that the respondents were entitled to a jury trial under the *Seventh Amendment*, despite the equitable [**164] nature of the underlying action, since the relief sought was legal in nature. See, e.g., *Beacon Theatres, Inc. v. Westover*, 359 U.S. 500, 3 L. Ed. 2d 988, 79 S. Ct. 948 (1959):

As this Court said in *Scott v. Neely*, 140 U.S. 106, 109-110, 35 L. Ed. 358, 11 S. Ct. 712: "In the Federal courts this [jury] right cannot be dispensed with, except by the assent of the parties entitled to it, nor can it be impaired by any blending with a claim, properly cognizable at law, of a demand for equitable relief in aid of the legal action or during its pendency."

359 U.S. at 510 (footnote omitted). See also *Atlas Roofing Co. v. Occupational Safety and Health Review Comm'n*, 430 U.S. 442, 51 L. Ed. 2d 464, 97 S. Ct. 1261 (1977).

On this history, it is jarring to come upon the majority's argument that the *Seventh Amendment* no longer applies because there are now "claims" in United States patents, whereas the old English patents did not have claims as we know them. The removal of the jury right is not so casually achieved:

The Constitution is concerned, not with form, but with substance. All of vital significance in trial by jury is that issues of fact be submitted for determination with such instructions and guidance by the court as will afford opportunity [**165] for that consideration by the jury which was secured by the rules governing trials at common law.

Gasoline Prods. Co. v. Champlin Ref. Co., 283 U.S. 494, 498, 75 L. Ed. 1188, 51 S. Ct. 513 (1931).

However, the argument about claims does bring out a point of curiosity, for the law of eighteenth-century England required specificity in "particularly describing" what was patented, and the patent grant ended with a concise summary of the subject matter, with details annexed in the specification; patent "claims," in turn, are concise summaries of the subject matter, with details annexed in the specification. Following is a portion of a representative letters patent dated March 28, 1764:

To all to whom these presents shall come, John Morris, of the town of Nottingham, hosier, sendeth greeting:--

Whereas, the King's Most Excellent Majesty, by letters patent under the Great Seal of Great Britain, bearing the date at Westminster, [gave and granted to the inventors] sole privilege . . . to make, use, exercise, and vend their invention . . . in which said letters patent is contained a proviso that if the said Thomas and John Morris, and John and William Betts, or any one of them should not [**166] particularly describe the nature of the said invention and in what manner the same is to be performed by an instrument, in writing under their hands and seals, or the hand and seal of one of them, and cause the same to be enrolled in the High Court of Chancery . . .

[The specification ending with:] Now know ye, that I, the said John Morris, in pursuance of the said proviso in the said letters patent contained, do hereby declare

that the said invention of an engine or machine, on which is fixed a set of working needles, which engine or machine is fixed to a stocking-frame for the making of oilet-holes or net-work in silk, thread, cotton, or worsted, as mitts, gloves, hoods, aprons, handkerchiefs, and other goods usually manufactured upon stocking-frames by a method entirely new, is particularly described in the plans hereunto annexed.

Morris v. Bramson, 1 Carp. P.C. at 31-32 n. * (emphasis added). The requirement that the inventor "particularly describe" the invention was carried into the United States Patent Act of 1790:

[*1017] Sec. 2. And be it further enacted, That the grantee or grantees of each patent shall, at the time of granting the same, deliver [**167] to the Secretary of State a specification in writing, containing a description, accompanied with drafts or models, and explanations and models (if the nature of the invention or discovery will admit of a model) of the thing or things, by him or them invented or discovered, and described as aforesaid, in the said patents; which specification shall be so particular, and said models so exact, as not only to distinguish the invention or discovery from other things before known and used, but also to enable a workman or other person skilled in the art or manufacture, whereof it is a branch, or wherewith it may be nearest connected, to make, construct, or use the same . . .

Patent Act of 1790, ch. 7, § 2, 1 Stat. 109, 110 (1790) (emphasis added).

This requirement was continued in all subsequent revisions, which were successively more explicit. In 1836 the Patent Act required that the inventor "particularly specify the part, improvement, or combination which he claims as his own invention." Ch. 357, § 6, 5 Stat. 117, 119. Again revised in 1870, the statute required that the inventor "particularly point out and distinctly claim the part, improvement, or combination which he [**168] claims as his invention or discovery." Ch. 230, § 26, 16 Stat. 198, 201. The present statute, enacted in 1952, states

that "the specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention." 35 U.S.C. § 112, P2. This evolution in statutory directive, requiring the inventor to be more specific as to what had been invented, did not remove the jury from trial of patent infringement cases.

The majority's other response to the Constitution is to call a patent a "statute," arguing that "statutory interpretation" is not for the jury. Designating a patent a statute in order to avoid the *Seventh Amendment* simply denies history and our heritage. Our judicial responsibility is to uphold the Constitution, not devise ways to circumvent it.

IV

PRECEDENT

A. FEDERAL CIRCUIT CASES SELECTED FOR CRITICISM AND OVERRULE

The Federal Circuit early in its existence deplored the "risk of effectively denying the constitutional right spelled out in the first clause of the *Seventh Amendment*," *Railroad Dynamics v. Stucki*, 727 F.2d at 1515, 220 U.S.P.Q. (BNA) at 937-38. Many Federal Circuit [*169] decisions implemented the correct standard of trial and appellate review in patent infringement cases. The majority now expressly disapproves appellate deference to the trier of fact on the issues of fact that are determined in the course of "construing" the meaning and scope of patent claims, issues of fact that are dispositive of the question of patent infringement. The majority singles out seven cases for specific criticism, and fatally taints the many other cases that applied the correct standard of deference to the trier of fact.

The majority explains that it overrules these cases because this court held that the interpretation of disputed technologic terms in patent claims raises jury-triable issues, or because the panel applied a deferential standard of appellate review. Majority op. at 13-14. The majority does not tell us how such cases will be tried, now that appeal includes mandatory de novo adjudication of what were once recognized as triable facts. Even the least cynical observer must wonder at the court's capacity for this technological overload. A glance at the subject matter of the seven expressly disapproved cases illustrates these problems.

1. *McGill*, [*170] *Inc. v. John Zink Co.*, 736 F.2d 666, 221 U.S.P.Q. (BNA) 944 (Fed. Cir.), cert. denied, 469 U.S. 1037, 83 L. Ed. 2d 404, 105 S. Ct. 514 (1984).

The disputed technical term in the patent claim was "recovered liquid hydrocarbon absorbent." On McGill's view of what this term meant, the Zink process would infringe McGill's claim; on Zink's view, the Zink process [*1018] would not infringe. There was conflicting testimony of technical experts, and the issue was submitted to the jury. On appeal the Federal Circuit made the now-excoriated statement:

If, however, the meaning of a term of art in the claims is disputed and extrinsic evidence is needed to explain the meaning, construction of the claims could be left to the jury. In the latter instance, the jury cannot be directed to the disputed meaning for the term of art.

Id. at 672, 221 U.S.P.Q. (BNA) at 948 (citations omitted). On appellate review the court considered the meaning of the claims upon the following criterion:

In the instant case, the jury's finding of infringement was predicated on construction of claim 2. To obtain a reversal, Zink must demonstrate that no reasonable juror could have interpreted the claim in the fashion that supports the infringement [*171] finding. . . . Zink must convince us that there is no set of facts, consistent with McGill's interpretation, that was supported by substantial evidence.

Id. The majority now holds that the meaning of "recovered liquid hydrocarbon absorbent" and the other disputed technical terms that were at issue was not a jury triable issue, and that the Federal Circuit should have, and hereafter will, decide such questions as a matter of law.

2. *Bio-Rad Labs., Inc. v. Nicolet Instrument Corp.*, 739 F.2d 604, 222 U.S.P.Q. (BNA) 654 (Fed. Cir.), cert. denied, 469 U.S. 1038, 83 L. Ed. 2d 405, 105 S. Ct. 516 (1984).

The patented device was an interferometer that contained an oscillating mirror that varied the lengths of

two of four possible paths of split beams of reflected light, whereby the thickness of the epitaxial layer of a semiconductor was determined from the points of locally maximum constructive interference, by comparing phase differences. The jury trial lasted forty-four days. On appeal this court stated that we review to determine

whether reasonable jurors, after reviewing all the evidence, could have interpreted the claims to include the sequence of events followed by [the accused optical **172] apparatus].

Id. at 613, 222 U.S.P.Q. (BNA) at 661 (citing *Perkin-Elmer Corp. v. Computervision Corp.*, 732 F.2d 888, 893, 221 U.S.P.Q. (BNA) 669, 673 (Fed. Cir.), cert. denied, 469 U.S. 837, 83 L. Ed. 2d 120, 105 S. Ct. 187 (1984)). This court declined the losing party's request that we make a de novo interpretation of the claims:

We emphasize that our task is not to interpret the claims as though no trial occurred. Both parties submitted testimony in support of their interpretation before the jury. Bio-Rad's interpretation prevailed and was not overturned by the trial judge. On appeal, we consider only whether reasonable jurors could have interpreted the claim in the manner presumed.

Id. at 614, 222 U.S.P.Q. (BNA) at 661-62. This practice can no longer be followed, and the Federal Circuit shall somehow conduct these technological analyses for ourselves, as a matter of law.

3. *Pulumbo v. Don-Joy Co.*, 762 F.2d 969, 226 U.S.P.Q. (BNA) 5 (Fed. Cir. 1985).

This case too is criticized for its holding that the findings of disputed facts of the meaning of claim terms is for the trier of fact. The appeal reached us on summary judgment. Pulumbo sued Don-Joy for infringement of a patent to a patellar [*173] brace used in diagnosis and treatment of patellar subluxation (dislocation of the kneecap). In holding that summary judgment was improperly granted, this court referred to the disputed factual issues that had been raised in the depositions, as well as ambiguity in the prosecution history and the need for expert witnesses to present the viewpoint of those of skill in this art. The court stated:

If the language of a claim is not disputed, then the scope of the claim may be construed as a matter of law. But when the meaning of a term in a claim is disputed and extrinsic evidence is necessary to explain that term, then an underlying factual question arises, and construction of the claim should be left to the trier or jury under appropriate instruction.

Id. at 974, 226 U.S.P.Q. (BNA) at 8. Overruling the statement that the meaning of claim terms [*1019] can raise underlying factual questions and that disputed "claim construction" should be left to the trier or jury, the majority now requires that the Federal Circuit shall make these decisions de novo.

4. *Moeller v. Ionetics, Inc.*, 794 F.2d 653, 229 U.S.P.Q. (BNA) 992 (Fed. Cir. 1986).

As I mentioned supra, the majority [*174] also disapproves this case, criticizing its holding that "disputes over the meaning of claim language may raise factual questions reviewed for substantial evidence or clear error as the case may be." in the majority's words. The invention was a system of selectively measuring the concentration of certain cations in the presence of other components, by interposing a membrane barrier and using specified electrodes whereby cation-specific components such as nonactin, gramicidin, and valinomycin form positively charged complexes with the sensing device. The disputed term claims were "electrode," "electrode body," and "disposed in said body." The technologic meaning of these terms, in this usage and this invention, decided whether the terms encompassed the accused system. On appeal this court observed that the meanings of these terms were "clearly disputed," referring to conflicting evidence, and held that the matter required trial, vacating the grant of summary judgment. It appears that this court will now decide what these terms mean as a matter of law.

5. *H.H. Robertson Co. v. United Steel Deck, Inc.*, 820 F.2d 384, 2 U.S.P.Q.2D (BNA) 1926 (Fed. Cir. 1987).

In connection with [*175] a motion for preliminary injunction, the dispositive issue before the district court was the meaning of "bottomless trench" in a patent for a concrete deck structure for distributing electrical wiring.

The defendants argued that their structure was not "truly bottomless" because "horizontal metal sections" and a "horizontal metal strip" constituted a partial bottom. After a four-day hearing, the district court granted the preliminary injunction. In affirming, this court described its standard of review:

Claim construction is reviewed as a matter of law. However, interpretation of a claim may depend on evidentiary material about which there is a factual dispute, requiring resolution of factual issues as a basis for interpretation of the claim. In this case, there was extensive testimony on the issue of claim construction, including the conflicting views of experts on both legal and factual questions. Those factual considerations that are pertinent to the district court's construction of the term "bottomless" are reviewed under the clearly erroneous standard.

Id. at 389, 2 U.S.P.Q.2D (BNA) at 1929 (citations omitted). The majority condemns this case for its recognition that [*176] "claim construction" may require resolution of factual issues, and the use of the clearly erroneous standard of review for those factual findings. Not only juries, but trial judges, will now be denied the deference owed to their factual findings.

6. *Perini America, Inc. v. Paper Converting Mach. Co.*, 832 F.2d 581, 4 U.S.P.Q.2D (BNA) 1621 (Fed. Cir. 1987).

This too was a bench trial, and had been fully tried to the court. As I mentioned *supra*, the dispute related to various aspects of machines used in manufacturing paper towels. This court recognized that these were factual issues, reviewed on the clearly erroneous standard:

A trial court's conclusions on the scope of the claims are reviewable as matters of law, but findings on disputed meanings of terms in the claims and on the infringement issue must be shown to have been clearly erroneous.

Id. at 584, 4 U.S.P.Q.2D (BNA) at 1624 (citations omitted). The court observed that "legal conclusions [are] dictated by established facts and not the other way

around, and does not change the nature of the meaning-of-terms inquiry from one of fact to one of law." *Id.* The majority strongly criticizes, and overrules, [*177] these statements.

7. *Tol-O-Matic, Inc. v. Proma Produkt-Und Marketing Gesellschaft m.b. H.*, 945 F.2d 1546, 20 U.S.P.Q.2D (BNA) 1332 (Fed. Cir. 1991).

This was a jury trial. The technology related to rodless piston-cylinders. The invention [*1020] was for a yoke structure that reduces the forces tending to widen the slit through which the external load is moved by the piston, thereby avoiding loss of cylinder pressure. At issue was the meaning of the term "to provide for lateral support of the portions of the cylinder separated by the slit and spanned by the yoke." The decision required a choice between Tol-O-Matic's position that this term meant that the yoke must prevent all widening of the slit, and Proma's position that this term required only some resistance to slit widening. At the trial there was testimony by engineers representing both sides, who ran tests on rodless cylinders under various conditions and reached inconsistent results. The jury was instructed to consider all of the evidence and find the meaning of the disputed term, and then to apply it to the accused device. On appeal this court endorsed the procedure:

The interpretation of claims is defined as a matter [*178] of law based on underlying facts. Interpretation of the claim words "provide for lateral support" required that the jury give consideration and weight to several underlying factual questions, including in this case the description of the claimed element in the specification, the intended meaning and usage of the claim terms by the patentee, what transpired during the prosecution of the patent application, and the technological evidence offered by the expert witnesses. When the meaning of a term in a patent claim is unclear, subject to varying interpretations, or ambiguous, the jury may interpret the term en route to deciding the issue of infringement. The jury's verdict of noninfringement is reviewed, in accordance with the rules governing review of jury determinations, to ascertain whether reasonable jurors

could have interpreted the claim in a way that supports the verdict.

Id. at 1549-50, 20 U.S.P.Q. (BNA) at 1335-36 (emphases added) (citations omitted).

This case is severely criticized for the emphasized statements. According to the majority these questions are not factual, can not be given to the jury, are not reviewed with deference to the trier of fact, and will [*179] be decided de novo by the Federal Circuit.

B. OTHER IMPUGNED FEDERAL CIRCUIT CASES

The court in *Tol-O-Matic* cited *Tillotson, Ltd. v. Walbro Corp.*, 831 F.2d 1033, 4 U.S.P.Q.2D (BNA) 1450 (Fed. Cir. 1987); *Tandon Corp. v. United States Int'l Trade Comm'n*, 831 F.2d 1017, 4 U.S.P.Q.2D (BNA) 1283 (Fed. Cir. 1987); *Hovew v. Medical Components, Inc.*; *Moeller v. Ionetics, Inc.*; *Snellman v. Ricoh Co., Ltd.*, 862 F.2d 283, 8 U.S.P.Q.2D (BNA) 1996 (Fed. Cir. 1988), cert. denied, 491 U.S. 910, 105 L. Ed. 2d 707, 109 S. Ct. 3199 (1989); *Vieau v. Japax, Inc.*, 823 F.2d 1510, 3 U.S.P.Q.2D (BNA) 1094 (Fed. Cir. 1987); *Data Line Corp. v. Micro Technologies, Inc.*, 813 F.2d 1196, 1 U.S.P.Q.2D (BNA) 2052 (Fed. Cir. 1987); *Palumbo v. Don-Joy Co.*; *Bio-Rad Lab., Inc. v. Nicolet Instrument Corp.*; *Perkin-Elmer Corp. v. Computervision Corp.*; and *McGill, Inc. v. John Zink Co.* Only some of these decisions are today singled out for criticism; but all explicitly recognized the now-rejected difference between fact and law as applied to the meaning of disputed terms in patent claims, and all deferred, on appellate review, to the findings of the trier of fact.

For example, *Data Line v. Micro Technologies* related to computer technology [*180] wherein the jury, hearing expert testimony, interpreted "means for sensing the presence or absence of output data"; this court on appeal rejected the appellant's argument that the trial court should have "determined the scope and construction of claim 1," and instead gave deferential review to the jury verdict. In *Snellman v. Ricoh* the jury verdict was reviewed on the substantial evidence standard, not de novo. In *Delta-X Corp. v. Baker Hughes Production Tools, Inc.*, 984 F.2d 410, 415, 25 U.S.P.Q.2D (BNA) 1447, 1450 (Fed. Cir. 1993), this court approved the trial procedure whereby "because of disputes over claim terms, the judge instead left resolution of these disputes to the jury."

There are many more cases than those I have listed, in which the jury decided technological and other factual disputes concerning the meaning and scope of terms of patent claims, thereby also deciding the fact of infringement, and where the jury verdict was reviewed on the usual substantial evidence/reasonable [*1021] jury standard. There are many more cases than those I have listed, in which the district court at bench trial found the facts of what the claim terms mean and cover, and on appellate review this [*181] court applied the clearly erroneous standard of review. These procedures, which are in accord with factual determinations in other areas of litigation, have now been rejected. The new and unique treatment of disputed facts in patent cases does not appear to offer advantages to outweigh its disadvantages.

11

11 Although some amici curiae encouraged the Federal Circuit to find technological facts for ourselves, none explained the procedure by which we are to do so. Are we to read the entire record of the trial, re-create the demonstrations, decipher the literature of the science and art, are we to seek our own expert advice; must the parties be told the technical training of our law clerks and staff attorneys? No amicus explained how improved technological correctness -- that is, truth -- would be more likely to be achieved during the appellate process of page-limited briefs and fifteen minutes per side of argument.

C. THE MAJORITY'S CITED AUTHORITY

The authority on which the majority relies [*182] simply does not support its statement that "the Supreme Court has repeatedly held that construction of a patent claim is a matter of law exclusively for the court." Majority op. at 15. That statement is of course correct when deciding the legal effect of a patent claim, and when stating the law to be applied by the trier of fact in interpreting disputed terms. However, it is not correct with respect to findings of disputed factual issues, issues that usually relate to the meaning and scope of the technologic terms and words of technical art that define the invention. Even the majority's selected authority recognized that such issues are factual, to be found by the jury. Although the majority now equates these factual findings with "construction of a patent," the Supreme Court did not.

In *Winans v. Denmead*, 56 U.S. (15 How.) 330, 14 L.

Ed. 717 (1854) the invention was the conical shape of a coal-carrying railroad car, whereby the car could carry several times its weight in coal. The car described and claimed in Winans' patent had a circular cross-section; the accused car of Denmead had an octagonal cross-section. The trial court instructed the jury that since the patent described the circular [*183] shape, it was so limited. The Supreme Court held that the instruction was in error, and that the jury should have been instructed on the legal rule that the thing patented was not limited to the exact shape or form illustrated, but depended on whether the same function was performed in substantially the same way and with the same result -- the rule now called the "doctrine of equivalents."

As the majority states, the Court indeed "construed" the "thing patented." *56 U.S. at 338*. The "construction" was the legal rule that the claim could be infringed by an equivalent structure. Having corrected this error of law in the jury instructions, the Court did not then answer the factual question for itself, as now does the Federal Circuit. The Court remanded for retrial to the jury, on the correct instruction of law:

Whether, in point of fact, the defendant's cars did copy the plaintiff's invention, in the sense above explained, is a question for the jury, and the court below erred in not leaving that question to them upon the evidence in the case, which tended to prove the affirmative.

56 U.S. at 344.

In *Silsby v. Foote*, *55 U.S. (14 How.) 218, 14 L. Ed. 394 (1853)*, also relied on by [*184] the majority, the Court again did not remove factual issues from the jury. The Court construed the patent claim as a combination claim, and stated that the trial judge correctly instructed the jury on the law that all of the necessary parts of the claimed combination must be present in an infringing device. These were indeed matters of law. The Court stated that the trial judge properly left to the jury the question of which parts of the claimed device were necessary to its operation (which was to regulate the heat of a stove by automatically varying the position of the damper in response to temperature changes), as well as whether the defendants used these necessary parts.

The defendants had argued that the trial judge had

impermissibly left a question of [*1022] law to the jury. The Court pointed out that the question of which parts were necessary to regulate the heat of the stove was not a matter of law, but a question of fact to be decided by the jury:

The substance of the charge is, that the jury were instructed by the Judge, that the third claim in the specification was for a combination of such parts of the described mechanism as were necessary to regulate the heat of the stove; [*185] that the defendants had not infringed the patent, unless they had used all the parts embraced in the plaintiff's combination; and he left it to the jury to find what those parts were, and whether the defendants had used them.

We think this instruction was correct. The objection made to it is, that the court left to the jury what was matter of law. But an examination of this third claim, and of the defendants' prayers for instruction, will show that the Judge left nothing but matter of fact to the jury. The construction of the claim was undoubtedly for the court. The court rightly construed it to be a claim for a combination of such of the described parts as were combined and arranged for the purpose of producing a particular effect, viz., to regulate the heat of a stove.

....

.... But the defendants also desired the Judge to instruct the jury that the index, the detaching process, and the pendulum, were constituent parts of this combination. How could the Judge know this as matter of law?

Id. at 225-26. The Court affirmed that the factual question of what the claim covered was for the jury to decide, in the course of determining the [*186] question of infringement. Indeed, the Court's query was pointed: "How could the Judge know this as a matter of law?" *Id. at 226*.

In *Coupe v. Royer*, *155 U.S. 565, 39 L. Ed. 263, 15 S.*

Ct. 199 (1895) the Court held that there was legal error in the trial judge's description of the invention to the jury, and in the withdrawal of the question of infringement from the jury. The Court held that the trial judge had omitted a limitation contained in the claims of the patent (viz., that the orientation of the machine was vertical). It was indeed legal error to omit a claim limitation, then as now, and the Court, correcting this error, remanded for a new trial to the jury. The Court declined to give a peremptory instruction to the jury, stating that all of the differences are "the subject of legitimate consideration by the jury".

The question of infringement, arising upon a comparison of the Royer patent and the machine used by the defendants, should be submitted to the jury, with proper instructions as to the nature and scope of the plaintiffs' patent as hereinbefore defined, and as to the character of the defendants' machine.

155 U.S. at 579-80. This case again illustrates the Court's role [***187*] as assuring that the law is correctly stated to the jury, and the jury's role as trier of fact. Again, a case relied on by the majority does not support the majority's position.

In *Bischoff v. Wethered*, *76 U.S. (9 Wall.) 812, 19 L. Ed. 829 (1870)* the Court distinguished between the construction of the patent as a legal instrument, and the factual nature of the thing invented:

It is not the construction of the instrument, but the character of the thing invented, which is sought in questions of identity and diversity of inventions.

76 U.S. at 816. The issue was identity of invention, and the Court reiterated that the meaning of disputed terms of art is "a question of fact for the jury." *Id. at 814.* The majority includes *Bischoff* as authority for its removal of these findings of fact from the jury. That is a curious reading of the holding in *Bischoff*:

A case may sometimes be so clear that the court may feel no need of an expert to explain the terms of art or the descriptions contained in the respective patents, and may, therefore, feel authorized to leave the question of identity to the jury, under such

general instructions as the nature of the documents seems [***188*] to require. And in such plain cases the court would probably feel authorized to set aside a verdict unsatisfactory to itself, as against the weight of the evidence. But in all such cases the question [**1023*] would still be treated as a question of fact for the jury, and not as a question of law for the court. And under this rule of practice, counsel would not have the right to require the court, as a matter of law, to pronounce upon the identity or diversity of the several inventions described in the patents produced.

Id. (emphasis added). Indeed, only two years later the Court again considered the issue, and in *Tucker v. Spalding*, *80 U.S. (13 Wall.) 453, 20 L. Ed. 515 (1872)* the Court held that a prior patent and related expert testimony on the issue of "diversity or identity" were improperly withheld from the jury, describing the issue as a "mixed question of law and fact," and stating:

Whatever may be our personal opinions of the fitness of the jury as a tribunal to determine the diversity or identity in principle of mechanical instruments, it cannot be questioned that when the plaintiff, in the exercise of the option which the law gives him, brings his suit in the law in preference [***189*] to the equity side of the court, that question must be submitted to the jury, if there is so much resemblance as raises the question at all. And though the principles by which the question must be decided may be very largely propositions of law, it still remains the essential nature of the jury trial that while the court may on this mixed question of law and fact, lay down to the jury the law which should govern them, so as to guide them to truth, and guard them against error, and may, if they disregard instructions, set aside their verdict, the ultimate response to the question must come from the jury.

80 U.S. at 455.

In *Winons v. New York and Erie R. Co.*, *62 U.S. (21*

How.) 88, 16 L. Ed. 68 (1859) infringement was conceded, and the issue at trial was "originality." The Court stated that the trial judge "has given the only construction which the language of this specification will admit." *id.* at 101, in explaining to the jury that the invention was in the manner of arranging the wheels and the car body. Having explained the invention to the jury, the question of originality was held to be for the jury, not the court.

In discussing the appropriate use of expert witnesses, the [**190] Winans Court stated that "professors or mechanics" can not prove "legal construction of any instrument of writing," but may testify on matters of art or science:

Experts may be examined to explain terms of art, and the state of the art, at any given time. They may explain to the court and jury the machines, models, or drawings, exhibited. They may point out the difference or identity of the mechanical devices involved in their construction. The maxim of "unique in sua arte credendum" permits them to be examined to questions of art or science peculiar to their trade or profession; but professors or mechanics cannot be received to prove to the court or jury what is the proper or legal construction of any instrument of writing.

62 U.S. at 100-01. On this aspect, too, the case does not stand for the removal of factual findings from the jury; indeed the Court recognized the various kinds of evidentiary facts on which technical experts routinely testify in patent cases.

In *Heald v. Rice*, 104 U.S. 737, 26 L. Ed. 910 (1882) the Court stated that when there was no dispute about the technology, no need for evidence, and no question of fact requiring resolution by a jury, the "mere comparison" [**191] of a reissue and original patent was a matter of law for the court. Other cases related to a directed verdict when no fact was in dispute, e.g., *Singer Mfg. Co. v. Cramer*, 192 U.S. 265, 48 L. Ed. 437, 24 S. Ct. 291 (1904) (the trial court should have granted a directed verdict when there was no dispute as to the meaning of any term of art and no substantial evidence of infringement); or the grant of a new trial, e.g., *Market St.*

Cable Ry. Co. v. Rowley, 155 U.S. 621, 39 L. Ed. 284, 15 S. Ct. 224 (1895) (since the facts were not disputed and no extrinsic evidence was given or needed, the court should have instructed the jury on lack of patentable novelty; the Court remanded with directions to set aside the verdict and grant a new trial). The new trial and the directed verdict are modes of judicial management of the trial process, and quite different from the majority's decision simply to eliminate the jury.

[*1024] *Hogg v. Emerson*, 47 U.S. (6 How.) 437, 12 L. Ed. 505 (1848), another case relied on by the majority, was part of a lengthy litigation. There was a jury trial, review by a circuit panel, retrial to a jury, and two appeals to the Court. In this appeal the Court considered which documents were properly considered when "construing" the [**192] patent, in view of the fire that destroyed the Patent Office files in 1836. In reviewing the question of whether the patent in suit covered the entire steam engine or only the improvement, the Court "construed" the patent as covering only the improvement. *Id.* at 484. The Court affirmed the trial court, which the report states "left the question of fact as to reasonable diligence of the patentee or not in this respect, and also all questions of fact involved in the points of the case for the defendants, to the jury." *Id.* at 445.

The majority also relies on *Levy v. Gadsby*, 7 U.S. (3 Cranch) 180, 2 L. Ed. 404 (1805), wherein the Court ruled that a certain document was a contract and not some other form of transaction, and was subject to the usury law. This was legal construction of a document, and was decided by the Court. This case says nothing about removing disputed factual questions from the jury. The majority also cites *Eddy v. Prudence Bonds Corp.*, 165 F.2d 157, 163 (2d Cir. 1947), cert. denied, 333 U.S. 845 (1948), wherein the court, reviewing the legal operation of a court-approved Supplemental Trust Agreement in bankruptcy in view of a court order, stated that "appellate [**193] courts have untrammelled power to interpret written documents." This determination of legal effect is indeed "construction" of a legal document.

I shall not dwell on the majority's reliance on other cases that were bills of equity and tried to the court, for they do not raise the issue of the jury right. See *Loom Co. v. Higgins*, 105 U.S. 580, 26 L. Ed. 1177 (1881) (determining if patentee was the true inventor, and whether patent claim was sufficiently described in the specification); *Goodyear Dental Vulcanite Co. v. Davis*,

102 U.S. 222, 26 L. Ed. 149 (1880) (limiting Goodyear's claims to dentures manufactured by vulcanization); *Bates v. Coe*, 98 U.S. 31, 25 L. Ed. 68 (1878) (determining which elements constituted the invention and which constituted equivalents); *Merrill v. Yeomans*, 94 U.S. 568, 24 L. Ed. 235 (1876) (construing patent claim in light of specification as only for process of manufacture); and *Seymour v. Osborne*, 78 U.S. (11 Wall.) 516, 546, 20 L. Ed. 33 (1871) (discussing "scientific witnesses to aid the court in coming to a correct conclusion"). The majority cites *Merrill v. Yeomans* as "applying 'well-settled rules of construing all instruments.'" The rule the Court applies at this quotation is that words and phrases [**194] are to be construed so as to give them meaning. 94 U.S. at 571. This is indeed a rule of law; the Court did not convert findings of fact into rules of law. Nor should it be necessary to point out that when cases are tried "to the court," majority op. at 21-22, the resolution of disputes as to what claim terms mean is indeed "for the court."

Exhibit Supply Co. v. Ace Patents Corp., 315 U.S. 126, 52 U.S.P.Q. (BNA) 275, 86 L. Ed. 736, 62 S. Ct. 513 (1942), also cited by the majority, turned on prosecution history estoppel resulting from an amendment to the claims in the Patent Office. The Court stated the rule of law that "what the patentee, by a strict construction of the claim, has disclaimed . . . cannot now be regained by recourse to the doctrine of equivalents, which at most operates, by liberal construction." There was no dispute as to the meaning of technical terms, and the Court applied this rule of law to the undisputed facts. This had been a bench trial, on bill of equity. *Ace Patents Corp. v. Exhibit Supply Co.*, 119 F.2d 349, 48 U.S.P.Q. (BNA) 667 (7th Cir. 1941). It is difficult to discern the relevance of this case to the issues in *Markman*.

Many dozens of patent cases reached the Supreme Court. Some of those [**195] relied on by the majority as support for trial to the court were bills in equity. Of those in law, most were tried to a jury. It is not possible to diminish the great weight of precedent wherein patent infringement was tried to a jury, the jury deciding disputed factual questions of what the patent covered, and applying these findings to the accused device. The court today effects a dramatic realignment [**1025] of jury, judge, and the appellate process.

D. THE SPECIAL RESPONSIBILITY OF THE FEDERAL CIRCUIT

The Federal Circuit is responsible for establishing consistent national law in its areas of assigned subject matter. The court early in its existence took note that patent cases were only one of many areas of commercial dispute, only one of many areas of intellectual property dispute, that are tried in the district courts. We have striven to assure that unnecessary burdens are not placed upon the district courts of the nation by virtue of the separate path of appellate review of patent cases. We acted to assure that the same procedures would apply in the trial of patent cases as in other civil actions. See, e.g., *Allen Organ Co. v. Kimball Int'l, Inc.*, 839 F.2d 1556, [**196] 1563, 5 U.S.P.Q.2D (BNA) 1769, 1774 (Fed. Cir.) (for matters not unique to patent law the procedural law of the regional circuit applies in patent trials), cert. denied, 488 U.S. 850, 102 L. Ed. 2d 104, 109 S. Ct. 132 (1988). Thus the litigation process that served other civil disputes also served in patent litigation. Today's ruling, with its departures from the rules of evidence, its changed standards of deference and review, its conflict with established jury and bench procedures, challenges the principle on which this comity was based.

Patent cases are not unique in their usage of specialized terms and words of art, in their reliance on technologic or scientific evidence, in their dependence on findings of technologic fact. Evidentiary conflicts with respect to technology and science arise in a variety of cases; and the conflicting testimony of expert witnesses is ubiquitous. Trial judges have extensive experience in assuring a fair trial, and finding, within human limitations, the truth.¹² Today this court severs patent cases from all others, requiring different (and uncertain) procedures at trial, taking unto ourselves a different, and uncertain, appellate role.

12 Many aids to the trial process are at hand when the issues are scientific and technologic. The *Mammal for Complex Litigation*, Second (1985) points out the utility of special verdicts and interrogatories, see § 21.633, and that *Fed. R. Evid.* 706 is particularly useful when experts have divergent opinions, see § 21.51. Important studies have been made, see the Federal Judicial Center's Reference Manual of Scientific Evidence (1994). No study that I have seen or heard of proposes simply to turn complex factual determinations of technical issues over to the appellate court. To replace the trier of fact with the Federal Circuit is as unfriendly to the search for truth, as it is

unworkable.

[**197] It is the responsibility of the appellate court to assure that the law is correctly stated. The rules of patent law include an ever-enlarging body of nuance and clarification, flowing from twelve years of Federal Circuit jurisprudence and the rich history on which we have built. This court has undertaken the fine-tuning of the law, appropriate to the importance of technology in today's world. Much of this fine-tuning relates to new fields of science and technology (computers, biotechnology, materials); but it also relates to traditional concepts of patent law as applied to modern technologic and commercial needs.

The appellate role is to apply these principles in wise implementation of the policy of the law, as litigants probe the grey areas that test conflicting policy considerations. The appeal is not designed for de novo finding of the facts. I doubt the practical feasibility of the majority's holding that this court will "construe" the meaning of technical terms and words of art without benefit of the trial experience. It is of course appropriate for this court to be alert to methodologies of resolution of disputes that involve science and technology. The trial of scientific/technologic [**198] disputes was explored, for example, in the Report of the Carnegie Commission, Science and Technology in Judicial Decision Making (1993); the Report of the Brookings Institution, Charting a Future for the Civil Jury System (1992); and in ongoing studies and Reports of the Federal Judicial Center. However, in this complexity of problems and solutions, it is an illusion to think that patent litigation difficulties can be resolved by turning factual issues into matters of law and assigning them to the Federal Circuit.

The deference that appellate courts must give to the

trial process is fundamental to the [*1026] efficiency, and the effectiveness, of the judicial system. It implements the two-tier litigation right, and provides stability to the trial process while preserving appellate authority for the law, its policy and its purposes. The court's decision today denies the critical values of the trial, and moves the Federal Circuit firmly out of the juridical mainstream.

V

THE MERITS

Both sides testified on the meaning and scope of the term "inventory," as used by Markman and in light of the Westview system. The issue was whether "inventory" meant only clothing, or could [**199] reach the invoices of the Westview system. Markman presented four witnesses. Westview presented one witness. After the jury verdict in favor of Markman the district court, applying recent Federal Circuit panel opinions that required de novo determination of the issue (foreshadowing today's en banc holding), reviewed the evidence independently and decided in favor of Westview. The district court did not discuss the jury verdict, or state whether there was evidentiary support for the jury verdict.

The district court did not apply the proper standard on post-trial motions, viz. whether there was substantial credible evidence of such quality and weight that a reasonable jury could have reached the verdict that was reached by this jury. It is for the trial judge to decide, in the first instance, whether the jury verdict can stand, or whether the judgment should have been directed, or whether a new trial should be granted. I would remand for redetermination on the correct standard.

LEXSEE 192 F.3D 1362

**MEHL/BIOPHILE INTERNATIONAL CORP., SELVAC ACQUISITIONS CORP.
and NARDO ZAIAS, M.D., Plaintiffs-Appellants, v. SANDY MILGRAUM, M.D.,
PALOMAR MEDICAL TECHNOLOGIES, INC., and SPECTRUM MEDICAL
TECHNOLOGIES, INC., Defendants-Appellees.**

99-1038

UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

192 F.3d 1362; 1999 U.S. App. LEXIS 24277; 52 U.S.P.Q.2D (BNA) 1303

September 30, 1999, Decided

SUBSEQUENT HISTORY: Rehearing Denied October 27, 1999, Reported at: *1999 U.S. App. LEXIS 31386*.

PRIOR HISTORY: [**1] Appealed from: United States District Court for the District of New Jersey. Judge Alfred M. Wolin.

DISPOSITION: AFFIRMED.

COUNSEL: Jeffrey A. Schwab, Abelman, Frayne & Schwab, of New York, New York, argued for plaintiffs-appellants. With him on the brief were Michael Aschen and Anthony J. DiFilippi. Of counsel on the brief was George A. Arkwright. Schlesinger, Arkwright & Garvey, LLP, of Arlington, Virginia.

Wayne L. Stoner, Hale and Dorr, LLP, of Boston, Massachusetts, argued for defendants-appellees. With him on the brief were William F. Lee and James M. Hall. Of counsel on the brief was Thomas A. Reed, Palomar Medical Technologies, Inc., of Lexington, Massachusetts.

JUDGES: Before MAYER, MICHEL, and RADER, Circuit Judges.

OPINION BY: RADER

OPINION

[*1363] RADER, *Circuit Judge*.

In this patent infringement action, MEHL/Biophile

International Corp., Selvac Acquisitions Corp., and Dr. Nardo Zaias (collectively, MEHL/Biophile) asserted that Dr. Sandy Milgraum, Palomar Medical Technologies, Inc., and Spectrum Medical Technologies, Inc. (Milgraum) infringed U.S. Patent No. 5,059,192 (the '192 patent). On its motion for summary judgment, Milgraum contended that all of the '192 patent claims were anticipated [**2] by an instruction manual for the Spectrum RD-1200 laser and by a 1987 Journal of Investigative Dermatology article authored by Dr. Luigi Polla and others (the Polla article). The district court agreed that the manual anticipated the claims, granted summary judgment of invalidity, and dismissed the action. See *MEHL/Biophile Int'l* [*1364] *Corp. v. Milgraum*, 8 F. Supp. 2d 434, 47 U.S.P.Q.2D (BNA) 1248 (D.N.J. 1998). Although this court disagrees that the manual discloses all the elements of the claimed invention, because the Polla article does, this court affirms.

I.

The '192 patent, entitled "Method of Hair Depilation," claims a method for removing hair using a laser. Hairs grow out of hair follicles, tubular apertures in the skin. The collection of germ cells from which hairs grow, known as the papilla, lies at the base of the follicle. The '192 patent claims a method for destroying the papilla, thereby preventing hair regrowth. The written description discloses the use of a Q-switched ruby laser to effect the destruction.

At a meeting of the American Academy of Dermatology, Dr. Zaias visited Spectrum's booth where

Spectrum displayed such a laser, known as the RD-1200. Spectrum sold [*3] the RD-1200 for use in removing tattoos. Dr. Zaias recognized that the same principles that govern laser absorption in skin pigmented by a tattoo would also focus laser absorption on the natural skin pigment found in the papilla. More specifically, the papilla contains granules (called melanosomes) of a dark pigment (called melanin). A Q-switched ruby laser aimed at the hair follicle will penetrate the skin and reach the papillary melanin. At a particular wavelength, the laser will heat up and destroy the papilla without damaging surrounding tissue.

Claim 1 of the patent, the only independent claim, reads:

1. A method of hair depilation, comprising the steps of:

a) aligning a laser light applicator substantially vertically over a hair follicle opening, said applicator having an aperture of sufficient area to surround a hair follicle and overlie its papilla;

b) applying through said aperture to the hair follicle a pulse of laser energy of a wavelength which is readily absorbed by the melanin of the papilla and having a radiant exposure dose of sufficient energy and duration to damage its papilla so that hair regrowth is prevented and scarring of the surrounding skin [*4] is avoided.

Dependent claims 2-6 further specify parameters of the laser light applicator, energy delivery, and the type of laser.

MEHL/Biophile sued Milgraum in the United States District Court for the District of New Jersey for infringement of all the claims of the '192 patent. Milgraum moved for summary judgment of invalidity based on 35 U.S.C. § 102 (1994), arguing that two prior art references each teach all the limitations of the claims. As noted at the outset, Milgraum relied on the manual for the RD-1200 laser which describes the use of a laser to remove tattoos. The manual teaches the use of a Q-switched ruby laser to remove a tattoo: "Energy is selectively absorbed only by pigmented chromophores and not surrounding tissue, greatly reducing the risk of scarring."

Milgraum also relied on the Polla article entitled "Melanosomes Are a Primary Target of Q-Switched Ruby Laser Irradiation in Guinea Pig Skin." The Polla article documents "the tissue damage induced by Q-switched ruby laser pulses in black, brown, and albino (control) guinea pigs . . . in an effort to define the nature and extent of pigmented cell injury." The method involves epilating [*5] guinea pigs with soft wax, holding the aperture of the laser in contact with the skin, and pulsing the laser. Using an electron microscope, the researchers observed "disruption of melanosomes deep in the hair papillae."

The district court considered both references, but ultimately rested its decision on the RD-1200 manual. MEHL/Biophile appeals. MEHL/Biophile makes several arguments for disregarding the manual as an anticipating reference. For instance, MEHL/Biophile argues that the manual does not teach use of the laser to remove hair at all. Further MEHL/Biophile contends that the manual does not disclose a substantially vertical alignment, a claim element. As for the Polla article, [*1365] MEHL/Biophile argues that the reference relates to guinea pig skin and does not mention hair depilation. In addition, MEHL/Biophile contends that the epilating of the guinea pig backs removed the papilla so the laser treatment could not have damaged the papilla.

II.

This court reviews a district court's grant of summary judgment by reapplying the standard applicable at the district court. See *Conrov v. Reebok Int'l, Ltd.*, 14 F.3d 1570, 1575, 29 U.S.P.Q.2D (BNA) 1373, 1377 (Fed. Cir. 1994). Summary [*6] judgment is appropriate only when "there is no genuine issue as to any material fact and . . . the moving party is entitled to a judgment as a matter of law." *Fed. R. Civ. P. 56(c)*. In its review, this court draws all reasonable inferences in favor of the non-movant. See *Anderson v. Liberty Lobby, Inc.*, 477 U.S. 242, 255, 91 L. Ed. 2d 202, 106 S. Ct. 2505 (1986).

"To anticipate a claim, a prior art reference must disclose every limitation of the claimed invention, either explicitly or inherently." *In re Schreiber*, 128 F.3d 1473, 1477, 44 U.S.P.Q.2D (BNA) 1429, 1431 (Fed. Cir. 1997). As this court's predecessor stated in *In re Oelrich*, 666 F.2d 578, 581, 212 U.S.P.Q. (BNA) 323, 326 (CCPA 1981) (quoting *Hansgig v. Kenner*, 26 C.C.P.A. 937, 102 F.2d 212, 214, 40 U.S.P.Q. (BNA) 665, 667 (CCPA 1939)) (internal citations omitted):

Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing *may* result from a given set of circumstances is not sufficient. If, however, the disclosure is sufficient to show that the natural result flowing from the operation as taught would result in the performance [**7] of the questioned function, it seems to be well settled that the disclosure should be regarded as sufficient.

Thus, a prior art reference may anticipate when the claim limitation or limitations not expressly found in that reference are nonetheless inherent in it. *See In re Oelrich*, 666 F.2d at 581; *Verdegaal Bros., Inc. v. Union Oil Co. of Cal.*, 814 F.2d 628, 630, 2 U.S.P.Q.2D (BNA) 1051, 1053 (Fed. Cir. 1987). Under the principles of inherency, if the prior art necessarily functions in accordance with, or includes, the claimed limitations, it anticipates. *See In re King*, 801 F.2d 1324, 1326, 231 U.S.P.Q. (BNA) 136, 138 (Fed. Cir. 1986). Inherency is not necessarily coterminous with the knowledge of those of ordinary skill in the art. Artisans of ordinary skill may not recognize the inherent characteristics or functioning of the prior art. *See id.*, 801 F.2d at 1326.

The RD-1200 Manual

The RD-1200 manual cannot anticipate because it does not teach all the limitations of the claimed invention. Claim 1 includes the step of "aligning a laser light applicator substantially vertically over a hair follicle opening." The parties agree [**8] that the manual does not discuss hair follicles, let alone aligning the laser over a hair follicle opening. Thus, the manual does not explicitly teach alignment substantially vertically over a follicle opening. Without explicit teachings of this claim limitation, this court must nonetheless examine whether such alignment is inherent in the manual's disclosure.

The manual teaches aiming the laser at skin pigmented with tattoo ink. The record discloses no necessary relationship between the location of a tattoo and the location of hair follicles. Therefore, an operator of the RD-1200 laser could use the laser according to the manual without necessarily aligning the laser "substantially vertically over a hair follicle opening." The

possibility of such an alignment does not legally suffice to show anticipation. *See In re Oelrich*, 666 F.2d at 581. Occasional results are not inherent. Because this court holds that the manual does not inherently teach this limitation of the claimed invention, it does not address MEHL/Biophile's other arguments. To anticipate, a single reference must teach every limitation of the claimed invention. Without an inherent teaching about alignment, [**9] the manual does not anticipate the claimed invention.

[*1366] The Polla Article

Although the district court did not reach the Polla article in its anticipation analysis, "appellees always have the right to assert alternative grounds for affirming the judgment that are supported by the record." *Datascope Corp. v. SMC, Inc.*, 879 F.2d 820, 822 n.1, 11 U.S.P.Q.2D (BNA) 1321, 1322 n.1 (Fed. Cir. 1989). Milgram asserts that the Polla article constitutes such an alternative ground. This court agrees.

As to the "aligning" step, the Polla article does not suffer from the same deficiency as the manual. It is not a question of probabilities as to whether a person of ordinary skill following the teachings of the article will align the laser light applicator over a hair follicle. The researchers focused their study on the epilated backs of guinea pigs. No one disputes that guinea pigs have hairy backs. Indeed, the article itself is replete with references to the irradiation of hair follicles and resulting follicular damage:

At 0.8 J/cm², epidermal lesions were more marked and involved hair follicles 0.3 mm below the skin surface Lesions were also present 0.5 mm deep in follicles. [**10]

Even at the highest radiant exposure (1.2 J/cm²), brown [guinea pig] skin never showed full-thickness epidermal necrosis and at 0.8 J/cm², follicular damage was observed to a depth of 0.5 mm and at 1.2 J/cm² to a depth of 0.7 mm below the skin surface.

Follicular changes were similar in nature and extent to the epidermal

alterations described above, and were associated with melanosome disruption.

....

Specifically, we have shown that . . . pigmented structures in the deep dermis such as hair follicles are affected . . .

The article further contains a photograph showing "follicular changes induced by ruby laser." The changes include disruption of "melanosomes contained within follicular epithelium." Moreover the article specifically mentioned disruption of the hair papillae:

At 0.8 and 1.2 J/cm2, individual melanosomes were more intensely damaged and disruption of melanosomes deep in the hair papillae was observed.

Finally, the method of exposing the Q-switched ruby laser to the guinea pig skin also inherently teaches substantially vertical alignment over hair follicle openings:

The collimated laser beam struck a circular [*11] aperture, 2.5 mm in diameter, held in contact with the skin of the animals.

The record shows that holding the collimated laser in contact with the skin would align it perpendicular to the skin surface and therefore substantially vertically over follicle openings. Viewed as a whole, this disclosure shows, in the words of *In re Oelrich*, 666 F.2d at 581, that the "natural result flowing from the operation as taught would result in" alignment of the laser light over a hair follicle, as claimed. No reasonable jury could find otherwise.

MEHL/Biophile's remaining arguments concerning the Polla article are unavailing. The Polla article concerns itself with guinea pig, rather than human, skin, but that difference is irrelevant to the anticipation analysis. Nothing in the claim limits the method's reach to human skin. Similarly, the Polla article's failure to mention hair depilation as a goal is similarly irrelevant. MEHL/Biophile does not dispute on appeal that the laser operating parameters disclosed in the article substantially coincide with those disclosed in the patent. Accordingly, to the extent the embodiment in the patent achieves hair depilation, so does the [*12] Polla method. Where, as here, the result is a necessary consequence of what was deliberately intended, it is of no import that the article's authors did not appreciate the results. See *W.L. Gore & Assocs. v. Garlock, Inc.*, 721 F.2d 1540, 1548, 220 U.S.P.Q. (BNA) 303, 309 (Fed. Cir. 1983). Finally, as mentioned earlier, the article itself belies MEHL/Biophile's argument that the wax epilation prescribed by the article resulted in removal of the papilla. [*1367] The article specifically states that "disruption of melanosomes deep in the hair papillae was observed." MEHL/Biophile's expert testimony contradicting the plain language of the reference does not create a genuine issue of fact.

Thus, the Polla article anticipates claim 1 of the '192 patent. Because MEHL/Biophile has not separately argued the validity of the dependent claims, the judgment of invalidity as to those claims also stands.

COSTS

Each party shall bear its own costs.

AFFIRMED

LEXSEE 334 F.3D 1314

OMEGA ENGINEERING, INC., Plaintiff-Appellant, v. RAYTEK CORPORATION, DAVIS INSTRUMENT MANUFACTURING COMPANY, INC., COLE-PARMER INSTRUMENT COMPANY, and DWYER INSTRUMENTS, INC., Defendants-Appellees. RAYTEK CORPORATION, Plaintiff-Appellee, v. OMEGA ENGINEERING, INC., Defendant-Appellant, and NEWPORT ELECTRONICS, INC., Defendant.

01-1546, 02-1478

UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

334 F.3d 1314; 2003 U.S. App. LEXIS 13570; 67 U.S.P.Q.2D (BNA) 1321

July 7, 2003, Decided

PRIOR HISTORY: [**1] Appealed from: United States District Court for the District of Connecticut. Judge Janet C. Hall.
Omega Eng'g, Inc. v. Cole-Parmer Instrument Co., 198 F. Supp. 2d 152, 2002 U.S. Dist. LEXIS 6063 (D. Conn., 2002)

DISPOSITION: Reversed and remanded.

COUNSEL: Richard G. Greco, Kaye, Scholer LLP, of New York, New York, argued for Omega Engineering, Inc. Of counsel on the brief were Peter W. Peterson and Robert Curcio. DeLio & Peterson, LLC, of New Haven, Connecticut.

A. James Isbester, Isbester & Associates, of Berkeley, California, argued for Raytek Corporation, et al. With him on the brief were Robert L. Risberg and Paul Svendsen.

JUDGES: Before MICHEL, CLEVENER, and SCHALL, Circuit Judges.

OPINION BY: CLEVENER

OPINION

[*1317] CLEVENER, *Circuit Judge*.

Omega Engineering, Inc. ("Omega") appeals the grants of summary judgment in favor of Raytek

Corporation, Davis Instrument Manufacturing Company, Inc., Cole-Parmer Instrument Company, and Dwyer Instruments, Inc. (collectively "Raytek"). In this appeal involving three consolidated actions, the district court ruled that Raytek did not infringe the asserted claims of *U.S. Patents Nos. 5,727,880* (the "'880 patent"), 5,823,678 (the "'678 patent"), and 5,823,679 (the "'679 patent"). Based on its claim construction, the trial court also invalidated claims 33 and 41 of the '679 [*2] patent as indefinite. Because the district court erred in its claim construction of the patents in suit, we reverse and remand.

[*1318] I

The patents in suit relate to a laser sighting system for use on infrared thermometers. Such sighting systems address a problem particular to the operation of infrared thermometers, which are also called radiometers.

Before the advent of radiometers, mercury thermometers and other traditional means of measuring an object's temperature required physical contact between the sensor and the measured object. In many situations, however, physical contact is difficult or even impossible, such as when the object is a moving piece of machinery in an industrial setting or has a temperature that exceeds the melting point of the sensor.

To address that problem, infrared thermometers can measure a surface's temperature remotely by assessing the amount of heat energy emitted in the form of infrared

radiation. The radiometer detects infrared energy through a lens, which receives and directs radiation in the same way that the optics of a telescope receive visible light waves. Like a telescope, the radiometer's lens only detects radiation within its optical "field of view."

Because the radiometer measures temperature by averaging the temperature of all surfaces within its field of view, the optimum temperature measurement occurs when the target area perfectly fills the entire field of view. Under less than optimum conditions, the indicated temperature represents a mixture of object and background temperatures, possibly leading to inaccurate readings. It is therefore important to determine the location of the field of view and the extent to which it encompasses the target area.

Since infrared radiation is not visible to the naked eye, a radiometer user cannot easily determine the size and position of the surface area encompassed by the field of view. Several sighting systems for infrared thermometers have attempted to address that problem. For instance, *U.S. Patent No. 4,494,881* issued to Everest ("Everest") illuminates the entire area encompassed by the field of view by directing onto it a beam of incandescent light. Similarly, Japanese Patent No. 62-12848 ("JP 62-12848") uses a plurality of incandescent light beams to identify the target area and its periphery. Other systems, such as the one disclosed by *U.S. Patent No. 4,315,150* issued to [**4] Derringer ("Derringer"), use a single laser beam directed to the center of the area covered by the field of view.

The patents in suit disclose another sighting system for infrared thermometers. These patents teach methods or devices for using one or more laser beams to visually "outline" or determine "the periphery" of the surface area encompassed by the field of view. That target area within the field of view is known as the "energy zone," which the patents define as the surface area from which emanates 90 percent of the radiated energy received by the radiometer. '880 patent, col. 2, ll. 15-16; '678 patent, col. 2, ll. 25-26; '679 patent, col. 2, ll. 30-31.

The three patents in suit have the same genealogy, originating from an ancestor patent application that matured into *U.S. Patent No. 5,368,392* (the "'392 patent"). The oldest patent in suit, the '880 patent, is the grandchild of the '392 patent and discloses a sighting device using at least one laser beam to outline the energy zone. The broadest claim covers:

1. A laser sighting device for outlining an energy zone to be measured by a radiometer when measuring the temperature of a surface, said device including:

means [**5] for projecting at least one laser beam toward said surface; and

means for causing said at least one laser beam to strike the periphery of the [**1319] energy zone for visibly outlining said entire energy zone.

'880 patent, col. 9, ll. 34-41 (emphases added). Claim 16 covers a laser sighting device to identify the center and periphery of the energy zone:

16. A laser sighting device for identifying and defining the center and periphery of an energy zone to be measured by a radiometer when measuring the temperature of a surface, said device including:

means for projecting project at least one laser beam toward said surface; and

means for causing said at least one laser beam to identify and define both the center and only the periphery of said energy zone.

Id., col. 10, ll. 24-33 (emphases added). All of the asserted claims of this patent (claims 1, 3, 16 and 18) are concededly written in means-plus-function format.

As a continuation in part of the '880 patent, the '678 patent claims methods and devices using more than two laser beams to outline the energy zone. Claim 1 of the '678 patent states:

1. A method for outlining an energy zone [**6] on a surface whose temperature is to be measured using the combination of a radiometer and a laser aiming device, said method comprising the steps of providing said laser device associated with said radiometer, and causing said device to emit simultaneously a plurality of more than two laser beams

towards said surface to strike said surface at individual mutually spaced locations to outline said energy zone.

'678 patent, col. 10, ll. 55-62 (emphases added).

Although it issued on the same day as the '678 patent, the '679 patent is in fact a continuation in part of the '678 patent and teaches the use of at least three laser beams to outline the energy zone. The broadest independent claim of the '679 patent covers:

1. A method for outlining an energy zone on a surface whose temperature is to be measured using the combination of a temperature measurement device and a laser sighting device, said method comprising the steps of providing a laser sighting device associated with said temperature measurement device and causing said laser device to emit a plurality of at least three laser beams toward said surface to strike said surface simultaneously at mutually [**7] spaced locations serving to outline said energy zone.

'679 patent, col. 12, l. 64 - col. 13, l. 5 (emphases added).

Omega asserted infringement of all three patents by Raytek's MX and ST series devices. The MX models use a diffraction device to divide a laser beam into sixteen separate beams, fifteen of which are directed to the periphery of the energy zone while the sixteenth beam is directed to the center of the zone. Similarly, the ST models use a diffraction device or beam splitter to divide a laser beam into multiple beams projecting around the energy zone, with one beam directed into the center of the energy zone. In its pleadings, Omega asserted that the MX and ST devices infringed claims 1, 3, 16 and 18 of the '880 patent; all of the claims of the '678 patent except claim 5; and claims 1 to 53 of the '679 patent.

In resolving the parties' claim construction disputes, the district court interpreted the phrases "to outline the energy zone," "outline visibly" the energy zone, "to outline visibly the periphery," and equivalent phrases in the asserted claims of the '678 and '679 patents as excluding a laser beam directed inside the energy zone. The trial court also [**8] interpreted "means for causing"

in claim 1 of the '880 patent as projecting [*1320] a laser beam toward the surface but not encompassing any "light striking the center or interior portion of the energy zone." In the same vein, the court read claim 16 of the '880 patent as precluding the simultaneous identification of the center and periphery of the energy zone by the "means for causing."

Based on its construction of the claims and the undisputed fact that the accused devices have a laser beam directed to the center of the energy zone, the district court granted summary judgment of noninfringement in Raytek's favor. In the alternative, the trial court also granted summary judgment invalidating claims 33 and 41 of the '679 patent for indefiniteness, because claims 33 and 41 explicitly require a central laser beam while being dependent on claims construed to exclude any laser beam directed inside the energy zone. Omega timely appealed, vesting us with jurisdiction pursuant to 28 U.S.C. § 1295(a)(1).

II

We review the grant of summary judgment de novo, without deference to the district court's determinations. *FMS Tech., Inc. v. Haas Automation, Inc.*, 206 F.3d 1422, 1429, 54 USPQ2d 1129, 1133 (Fed. Cir. 2000). [**9] We therefore reapply the standard set forth in *Rule 56 of the Federal Rules of Civil Procedure*. *Santiger, Inc. v. Scientific Research Funding Group*, 189 F.3d 1327, 1334, 51 USPQ2d 1811, 1815 (Fed. Cir. 1999).

A motion for summary judgment shall be granted where "there is no genuine issue as to any material fact and . . . the moving party is entitled to a judgment as a matter of law." *Fed. R. Civ. P. 56(c)*. Summary judgment is therefore appropriate when there is no genuine issue of material fact or when, drawing all factual inferences in favor of the nonmoving party, no "reasonable jury could return a verdict for the nonmoving party." *Anderson v. Liberty Lobby, Inc.*, 477 U.S. 242, 248, 91 L. Ed. 2d 202, 106 S. Ct. 2505 (1986). The party opposing the motion cannot rest on the mere allegations or denials of his pleading, but must "go beyond the pleadings and by her own affidavits, or by the 'depositions, answers to interrogatories, and admissions on file' designate 'specific facts showing that there is a genuine issue for trial.'" *Celotex Corp. v. Catrett*, 477 U.S. 317, 324, 91 L. Ed. 2d 265, 106 S. Ct. 2548 (1986) (citation omitted). [**10] Material facts are those which "might affect the outcome of the suit under the governing law." *Anderson*, 477 U.S.

at 248. Any doubt as to the existence of any issue of material fact requires denial of the motion. *Id.*

A determination of infringement involves a two-step analysis. "First, the claim must be properly construed to determine its scope and meaning. Second, the claim as properly construed must be compared to the accused device or process." *Carroll Touch, Inc. v. Electro Mech. Sys., Inc.*, 15 F.3d 1573, 1576, 27 USPQ2d 1836, 1839 (Fed. Cir. 1993). We review the first step, determining the meaning and scope of the patent claims, as a matter of law, without deference to the trial court. *Cybor Corp. v. FAS Techs., Inc.*, 138 F.3d 1448, 1456, 46 USPQ2d 1169, 1174 (Fed. Cir. 1998) (en banc). The second step, comparing the properly construed claims to the accused device, is a question of fact. *Bai v. I. & J. Wings, Inc.*, 160 F.3d 1350, 1353, 48 USPQ2d 1674, 1676 (Fed. Cir. 1998).

As mandated by the definiteness requirement of the Patent Act, a specification must conclude with claims "particularly pointing out [*11] and distinctly claiming the subject matter which the applicant regards as his invention." 35 U.S.C. § 112, P 2 (2000). Determining whether a claim is definite requires an analysis of "whether [*1321] one skilled in the art would understand the bounds of the claim when read in light of the specification If the claims read in light of the specification reasonably apprise those skilled in the art of the scope of the invention, § 112 demands no more." *Miles Labs., Inc. v. Shandon, Inc.*, 997 F.2d 870, 875, 27 USPQ2d 1123, 1126 (Fed. Cir. 1993). We conduct that analysis de novo, because "[a] determination of claim indefiniteness is a legal conclusion that is drawn from the court's performance of its duty as the construer of patent claims." *Personalized Media Communications, LLC v. Int'l Trade Comm'n*, 161 F.3d 696, 705, 48 USPQ2d 1880, 1888 (Fed. Cir. 1998).

III

Turning first to the summary judgment that claims 1 and 3 of the '880 patent were not infringed, we commence our plenary review of that ruling by determining the proper scope of the claims at issue. *TurboCare Div. of Demag Delaval Turbomachinery Corp. v. GE*, 264 F.3d 1111, 1120, 60 USPQ2d 1017, 1024 (Fed. Cir. 2001). [*12]

Claims 1 and 3 of the '880 patent require a "means for causing said at least one laser beam to [*1322] strike

the periphery of the energy zone for visibly outlining said entire energy zone." The parties agree that those claims at issue are in means-plus-function format and therefore invoke the provisions of 35 U.S.C. § 112, P 6. *See Wenger Mfg., Inc. v. Coating Mach. Sys., Inc.*, 239 F.3d 1225, 1232, 57 USPQ2d 1679, 1684 (Fed. Cir. 2001) (holding that claim limitation using the term "means for" and not reciting any structure presumptively falls within the scope of § 112, P 6).

Section 112, paragraph 6, allows a patentee to recite a function to be performed as a claim limitation rather than reciting structure or materials for performing that function. 35 U.S.C. § 112, P 6 (2000). The construction of a means-plus-function limitation follows a two-step approach. First, we must identify the claimed function. *Micro Chem., Inc. v. Great Plains Chem. Co., Inc.*, 194 F.3d 1250, 1258, 52 USPQ2d 1258, 1263 (Fed. Cir. 1999), staying true to the claim language and the limitations expressly recited by the claims. *Cardiac Pacemakers, Inc. v. St. Jude Med., Inc.*, 296 F.3d 1106, 1113, 63 USPQ2d 1725, 1730 (Fed. Cir. 2002). [*13] Once the functions performed by the claimed means are identified, we must then ascertain the corresponding structures in the written description that perform those functions. *Id.* A disclosed structure is corresponding "only if the specification or the prosecution history clearly links or associates that structure to the function recited in the claim." *B. Brown Med., Inc. v. Abbott Labs.*, 124 F.3d 1419, 1424, 43 USPQ2d 1896, 1900 (Fed. Cir. 1997). In other words, the structure must be necessary to perform the claimed function. *Northrop Grumman Corp. v. Intel Corp.*, 325 F.3d 1346, 1352, 66 USPQ2d 1341, 1345 (Fed. Cir. 2003).

A

At the threshold, the parties disagree on the proper function performed by the "means for causing" in claims 1 and 3 of the '880 patent. According to the text of claim 1, on which claim 3 is dependent, the "means" causes "at least one laser beam to strike the periphery of the energy zone for visibly outlining said entire energy zone." '880 patent, col. 9, ll. 39-41 (emphases added). The district court construed the phrase "strike the periphery . . . for visibly outlining" in the claims' function as encompassing the [*14] "projection of the laser light toward the surface, but does not encompass light striking the center or interior portion of the energy zone." In reaching that interpretation, the trial court reasoned that the language

of claims 1 and 3 requires the laser beam to only strike the periphery of the energy zone. To buttress that decision, the district court indicated that permitting the laser beam to strike the center of the energy zone would be contrary to the claim's purpose of visibly outlining the energy zone and contradict an express element of the claim. However, neither the reasons provided by the district court nor our plenary review of the intrinsic evidence support that claim interpretation.

"When construing the functional statement in a means-plus-function limitation, we must take great care not to impermissibly limit the function by adopting a function different from that explicitly recited in the claim." *Generation II Orthotics, Inc. v. Med. Tech., Inc.*, 2001 U.S. App. LEXIS 18420, 263 F.3d 1356, 1364-65, 59 USPQ2d 1919, 1926 (Fed. Cir. 2001). Despite that admonition, the trial court's ruling incorporated into the claim language a novel negative limitation. [*15] precluding the laser beam affected by the "means for causing" from striking the center or the interior of the energy zone. As construed by the district court, claims 1 and 3 now encompass a "means for causing said at least one laser beam to strike the periphery of the energy zone, but not strike the center or interior portion of the energy zone, for visibly outlining said entire energy zone."

This additional negative limitation finds no anchor in the explicit claim language. The express text of the claims does not prohibit the laser beam from striking inside the energy zone. The claims' wording only calls for the laser beam to "strike the periphery of the energy zone for visibly outlining said entire energy zone." '880 patent, col. 9, ll. 39-41. The phrase added by the district court finds no support in the text of the claims.

Nor is that negative limitation inherent in the term "periphery," as believed by the district court and argued by Raytek. The term's ordinary and customary meaning as discernible from dictionary evidence, see *Schumer v. Lab. Computer Sys., Inc.*, 308 F.3d 1304, 1311, 64 USPQ2d 1832, 1838 (Fed. Cir. 2002) ("The proper approach is to construe [*16] the claim language using standard dictionary definitions, because here, the claims have no specialized meaning."), is "the perimeter of a circle, ellipse, or other closed curvilinear figure." *Webster's Third New Int'l Dictionary* 1681 (1993). That definition does not necessitate the addition of a negative limitation, since nothing in the term's denotation precludes the laser beam from striking inside the energy

zone's perimeter. The plain words of the claims merely require that the laser beam strike the periphery of that zone.

In the same vein, we do not agree with the trial court that directing light inside the energy zone would contradict the claim's stated purpose of "visibly outlining said entire energy zone." The inherent contradiction identified by the district court exists only because it assumed that a laser beam directed inside the energy zone cannot at the same time outline that zone. That assumption, in turn, supposes two facts: (1) the claimed invention only has one laser beam, and (2) the sole laser beam is incapable of outlining while striking the inside of the energy zone at the same moment. The plain words of the claims belie the first supposition, since the claims [*17] permissibly call for "at least one laser beam." '880 patent, col. 9, l. 39 (emphasis added). The phrase "at least one" indicates that the "means for causing" does not necessarily act on only one laser beam. See *Rhine v. Casio, Inc.*, 183 F.3d 1342, 1345, 51 USPQ2d 1377, 1379 (Fed. Cir. 1999) ("Use of the phrase 'at least one' means that there could be only one or more than one."). The second supposition is equally flawed, because the claims only require that the laser beam strike the periphery to outline the energy zone. In other words, striking the inside of the [*1323] energy zone is not a requirement of the plain claim language, avoiding the necessity of the laser beam being both outside and inside the energy zone at the same time. Consequently, with both suppositions put to rest, the assumption made by the district court can no longer stand, exposing the alleged contradiction as a mere illusion.

Beyond the words of the claim, neither the district court nor Raytek has identified any express disclaimer or independent lexicography in the written description that would justify adding that negative limitation. See *CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1366-67, 62 USPQ2d 1658, 1662-63 (Fed. Cir. 2002). [*18] Our independent review of the patent document, see *Bell Ad. Network Servs., Inc. v. Covad Communications Group, Inc.*, 262 F.3d 1258, 1266, 59 USPQ2d 1865, 1869 (Fed. Cir. 2001), reveals no express intent to confer on the claim language the novel meaning imparted by this negative limitation. Accordingly, we must conclude that there is no basis in the patent specification for adding the negative limitation.

We indulge a "heavy presumption" that claim terms carry their full ordinary and customary meaning. *CCS Fitness*, 288 F.3d at 1366, 62 USPQ2d at 1662, unless the patentee unequivocally imparted a novel meaning to those terms or expressly relinquished claim scope during prosecution, see *Teleflex, Inc. v. Ficosa N. Am. Corp.*, 299 F.3d 1313, 1325-26, 63 USPQ2d 1374, 1380-81 (Fed. Cir. 2002). Raytek urges us to disregard that strong presumption and to condone the added negative limitation based on Omega's alleged disclaimer of the use of a central laser beam during the patent prosecution. See *Cybor Corp.*, 138 F.3d at 1457, 46 USPQ2d at 1175 (stating that a patent's prosecution history "is relevant to the construction [*19] of a claim written in means-plus-function form"). Omega of course disagrees. On the facts of this case, Omega's prosecution disclaimer is more circumscribed than Raytek asserts.

The doctrine of prosecution disclaimer is well established in Supreme Court precedent, precluding patentees from recapturing through claim interpretation specific meanings disclaimed during prosecution. See *Schreiber-Schroth Co. v. Cleveland Trust Co.*, 311 U.S. 211, 220-21, 85 L. Ed. 132, 61 S. Ct. 235, 1941 Dec. Comm'r Pat. 802 (1940) ("It is a rule of patent construction consistently observed that a claim in a patent as allowed must be read and interpreted with reference to claims that have been cancelled or rejected, and the claims allowed cannot by construction be read to cover what was thus eliminated from the patent."); *Crawford v. Heyinger*, 123 U.S. 589, 602-04, 31 L. Ed. 269, 8 S. Ct. 399, 1888 Dec. Comm'r Pat. 185 (1887); *Goodveor Dental Vulcanite Co. v. Davis*, 102 U.S. 222, 227, 26 L. Ed. 149, 1881 Dec. Comm'r Pat. 131 (1880); cf. *Graham v. John Deere Co.*, 383 U.S. 1, 33, 15 L. Ed. 2d 545, 86 S. Ct. 684 (1966) (ruling, in addressing the invalidity of the patents in suit, that "claims that have been narrowed in [*20] order to obtain the issuance of a patent by distinguishing the prior art cannot be sustained to cover that which was previously by limitation eliminated from the patent").

In light of the Court's guidance, we have adopted that doctrine as a fundamental precept in our claim construction jurisprudence. See *Tex. Digital Sys., Inc. v. Telegenix, Inc.*, 308 F.3d 1193, 1204, 64 USPQ2d 1812, 1819 (Fed. Cir. 2002); *Hockerson-Holberstadt, Inc. v. Avia Group Int'l, Inc.*, 222 F.3d 951, 956, 55 USPQ2d 1487, 1491 (Fed. Cir. 2000); *Southwall Techs., Inc. v. Cardinal IG Co.*, 54 F.3d 1570, 1576-77, 34 USPQ2d

1673, 1676-77 (Fed. Cir. 1995); *Biodex Corp. v. Loredan Biomedical, Inc.*, 946 F.2d 850, 863, 20 USPQ2d 1252, 1262 (Fed. Cir. 1991); *Standard [*1324] Oil Co. v. Am. Cyanamid Co.*, 774 F.2d 448, 452, 227 USPQ 293, 296 (Fed. Cir. 1985) (ruling that "the prosecution history (or file wrapper) limits the interpretation of claims so as to exclude any interpretation that may have been disclaimed or disavowed during prosecution in order to obtain claim allowance"); *McGill Inc. v. John Zink Co.*, 736 F.2d 666, 673, 221 USPQ 944, 949 (Fed. Cir. 1984). [*21] As a basic principle of claim interpretation, prosecution disclaimer promotes the public notice function of the intrinsic evidence and protects the public's reliance on definitive statements made during prosecution. See *Digital Biometrics, Inc. v. Identix, Inc.*, 149 F.3d 1335, 1347, 47 USPQ2d 1418, 1427 (Fed. Cir. 1998).

We have, however, declined to apply the doctrine of prosecution disclaimer where the alleged disavowal of claim scope is ambiguous. For instance, in *Northern Telecom Ltd. v. Samsung Electronics Company*, 215 F.3d 1281, 1293-95, 55 USPQ2d 1065, 1074-75 (Fed. Cir. 2000), the accused infringer relied on remarks made by the inventors to overcome a rejection as the basis for narrowing the broad language of the claims. Having independently considered the prosecution history, we viewed the inventors' statements as amenable to multiple reasonable interpretations and deemed the remarks so ambiguous that, "like the district court, we simply cannot tell." *Id.* at 1294, 55 USPQ2d at 1075. Since the prosecution statements were "far too slender a reed to support the judicial narrowing of a clear claim term," we declined to apply [*22] the doctrine of prosecution disclaimer under those circumstances. *Id.*; see also *Rexnord Corp. v. Laitram Corp.*, 274 F.3d 1336, 1347, 60 USPQ2d 1851, 1858 (Fed. Cir. 2001) (refusing to limit the ordinary meaning of the claim because the alleged disclaimer in the file wrapper was at best "inconclusive"); *Poll Corp. v. PTI Techs. Inc.*, 259 F.3d 1383, 1393-94, 59 U.S.P.Q.2D (BNA) 1763, 1770 (Fed. Cir. 2001) (finding that the scope of disclaimer over the prior art reference was ambiguous and thus remanding for clarification), *vacated on other grounds*, 535 U.S. 1109, 153 L. Ed. 2d 152, 122 S. Ct. 2324 (2002); *DeMarini Sports, Inc. v. Worth, Inc.*, 239 F.3d 1314, 1326-27, 57 USPQ2d 1889, 1895-96 (Fed. Cir. 2001) (refusing to rely on ambiguity surrounding examiner's silence or patentee's lack of argument during prosecution to construe claim term); *Vanguard Prods. Corp. v. Parker Hannifin Corp.*, 234 F.3d 1370, 1372, 57 USPQ2d 1087, 1089 (Fed. Cir.

2000) (refusing to narrow the asserted claim based on prosecution disclaimer because "the prosecution history does not support [the infringer's] argument that the Vanguard inventors 'expressly' [*23] 'disclaimed' claim scope beyond products made by co-extrusion"); *Serrano v. Telular Corp.*, 111 F.3d 1578, 1584, 42 USPQ2d 1538, 1542-43 (Fed. Cir. 1997); cf. *Spectrum Int'l, Inc. v. Sterilite Corp.*, 164 F.3d 1372, 1378, 49 USPQ2d 1065, 1068-69 (Fed. Cir. 1998) (noting that "explicit statements made by a patent applicant during prosecution to distinguish a claimed invention over prior art may serve to narrow the scope of a claim").

But where the patentee has unequivocally disavowed a certain meaning to obtain his patent, the doctrine of prosecution disclaimer attaches and narrows the ordinary meaning of the claim congruent with the scope of the surrender. For example, in *Rheox, Inc. v. Entact, Inc.*, 276 F.3d 1319, 1325, 61 USPQ2d 1368, 1373 (Fed. Cir. 2002), we ruled that the scope of the patent in suit did not cover "triple superphosphate"—an embodiment expressly disclosed in the written description—because the patentee cancelled a claim covering "triple superphosphate" and expressly disclaimed that compound in his arguments to the examiner to gain patent [*1325] allowance. *Id.* We reached a similar conclusion in *Ballard Medical Products v. Allegiance Healthcare Corporation*, 268 F.3d 1352, 1359-62, 60 USPQ2d 1493, 1499-1501 (Fed. Cir. 2001), [*24] which involved means-plus-function claims. There, the patentee asserted that the accused devices were equivalents, under paragraph 6 of section 112, to the claimed function's corresponding structure. *Id.* at 1359, 60 USPQ2d at 1499. We rejected that assertion on the basis of prosecution disclaimer:

When a patentee advises the examiner (and the public after patent issuance) that a particular structure is not within his invention, the patentee is not permitted to assert in a subsequent infringement action that the same structure is equivalent to the structure described in the patentee's specification for purposes of section 112, paragraph 6.

Id. Based on the clear disavowal found in the file wrapper, we concluded that the accused device did not include an equivalent to the claimed function's corresponding structure. *Id.* at 1362, 60 USPQ2d at 1501; see also *Bell Atl. Network*, 262 F.3d at 1273-75, 59

USPQ2d at 1874-76 (relying on prosecution history to limit claimed "transceiver" to the three stated modes, because of clearly limiting statements made by the patentee to the examiner to overcome a prior art rejection); [*25] *Day Int'l, Inc. v. Reeves Bros., Inc.*, 260 F.3d 1343, 1349, 59 USPQ2d 1790, 1794 (Fed. Cir. 2001) (holding that the patentee had disavowed curing done at the higher conventional curing temperatures, because of representations to the patent examiner that the prior art curing temperatures were too high and because of the numerous references to a "low temperature cure" or "low temperature vulcanization" throughout the file wrapper); *Southwall*, 54 F.3d at 1576-77, 34 USPQ2d at 1677 (holding that the limitation "sputter-deposited dielectric" excluded a two-step process, because the patentee argued during prosecution that the metal oxide in the process was "directly deposited" and that the invention thus only covered a one-step process).

To balance the importance of public notice and the right of patentees to seek broad patent coverage, we have thus consistently rejected prosecution statements too vague or ambiguous to qualify as a disavowal of claim scope. E.g., *Schwing GmbH v. Putzmeister Aktiengesellschaft*, 305 F.3d 1318, 1324-25, 64 USPQ2d 1641, 1645 (Fed. Cir. 2002) ("Prosecution history . . . cannot be used to limit the scope [*26] of a claim unless the applicant took a position before the PTO that would lead a competitor to believe that the applicant had disavowed coverage of the relevant subject matter."); *DeMarini Sports*, 239 F.3d at 1326-27, 57 USPQ2d at 1896. Rather, we have required the alleged disavowing statements to be both so clear as to show reasonable clarity and deliberateness, *N. Telecom*, 215 F.3d at 1294-95, 55 USPQ2d at 1075 (declining to apply doctrine because the infringer had not shown "that the patentees—with reasonable clarity and deliberateness—defined 'plasma etching' as excluding ion bombardment" (citation omitted)), and so unmistakable as to be unambiguous evidence of disclaimer. E.g., *Storage Tech. Corp. v. Cisco Sys. Inc.*, 329 F.3d 823, 833, 66 USPQ2d 1545, 1552 (Fed. Cir. 2003) ("We therefore do not consider the applicants' statement to be a clear and unambiguous disavowal of claim scope as required to depart from the meaning of the term provided by the written description."); *Invitrogen Corp. v. Biocrest Mfg., L.P.*, 327 F.3d 1364, 1369, 66 USPQ2d 1631, 1634 (Fed. Cir. 2003) ("The prosecution history does not [*27] show any clear and unambiguous disavowal of steps in advance of the step of growing *E. coli* cells in the

claimed temperature range."). Consequently, for prosecution disclaimer to attach, [*1326] our precedent requires that the alleged disavowing actions or statements made during prosecution be both clear and unmistakable.

1

1 We note that this is the same standard applicable, in the context of the doctrine of equivalents, to the doctrine of argument-based estoppel. *Litton Sys., Inc. v. Honeywell, Inc.*, 140 F.3d 1449, 1458, 46 USPQ2d 1321, 1327 (Fed. Cir. 1998), and that our precedent has recognized a relation between the doctrines of argument-based estoppel and prosecution disclaimer. *Alper Computer Corp. v. Nintendo Co. Ltd.*, 102 F.3d 1214, 1221, 40 USPQ2d 1667, 1673 (noting that "just as prosecution history estoppel may act to stop an equivalence argument under the doctrine of equivalents, positions taken before the PTO may bar an inconsistent position on claim construction").

[**28] In this case, the prosecution history indicates that a clear and unmistakable disclaimer occurred regarding the term "to visibly outline" in the claimed function, but not one as broad as Raytek urges. During the prosecution of the '880 application, the examiner rejected as obvious some of the filed claims based on a combination of three prior art references: (1) the Everest reference, which used incoherent incandescent light to illuminate the entire energy zone; (2) the JP 62-12848 reference, which used multiple incandescent light sources to identify the energy zone; and (3) the Darringer reference, which used a single laser beam to identify the center of the energy zone. Instead of amending the claim in response to the rejection, the patentee attempted to overcome the prior art by proffering a narrower meaning of the function performed by the "means for causing."

To overcome the combination of Everest and Darringer, Omega argued that Everest, alone or with Darringer, would add detectable heat to the energy zone and thus affect the accuracy of the temperature measurements. As the patentee explained:

The advantage offered by the invention of claim 1, amended, is that it provides [**29] a laser sighting device that relies on the use of at least one laser beam that is able to *outline* the energy zone on the

surface to be measured rather than illuminate the entire zone. The clear advantage offered by such a device is that it only directs energy at the edge of the energy zone to be measured to outline same and, as such, has virtually no effect on the temperature measurement to be taken. Such a concept is neither taught nor suggested in either Everest or Darringer et al., taken alone or in combination.

As this passage shows, Omega did not clearly and unmistakably disavow a device that directs light into the interior of the energy zone, contrary to the construction adopted by the trial court and urged by Raytek. Stated otherwise, the patentee did not deliberately and unambiguously define its invention as a device whose laser beams would remain outside of the energy zone. Rather, the patentee distinguished the prior art by clearly stating that its device would have "virtually no effect on the temperature measurement to be taken" when it outlines the energy zone. In drawing that distinction, Omega put the examiner and the public on notice of the invention's crucial [**30] feature: The invention would not add appreciable heat to the energy zone.

Were that passage the sole statement in the prosecution history, the disclaimer might not rise to the requisite level of being unmistakable. In this case, however, Omega strengthened its disavowal in response to the examiner's obviousness rejection based on the substitution of laser beams for JP 62-12848's incandescent lamps. To overcome that rejection, the patentee emphasized that:

When such a [sic] incoherent beam is projected parallel and in close proximity [**1327] to the outside boundaries of the invisible IR cone, a portion of the incoherent beam would diffuse towards the inside of the energy cone [sic]. The diffused portion of light inside the cone will hit the target energy zone in the form of heat energy and will be reflected back to the IR detector giving an erroneous temperature reading [A] laser produces a coherent beam whereas an incandescent lamp produces incoherent light. Since the laser can project a well-defined beam of light, it may be used

to define an IR heat zone accurately without infusing energy into the IR cone.

Again, the patentee's arguments did not focus on the [**31] projected laser beams remaining outside of the energy zone. Instead, Omega's concerns concentrated on how the coherent beams in its invention would "define an IR heat zone accurately without infusing energy into the IR cone." By avoiding the addition of heat into the energy zone, the patented device would provide a more accurate temperature reading.

Omega reiterated this point again in response to the rejection based on the combination of JP 62-12848 and Darringer. To overcome that rejection, the patentee argued that the lamps in JP 62-12848 were not, and could not be, laser beams. In essence, Omega distinguished JP 62-12848 on the basis that its incandescent lamps would allow heat to diffuse into the energy zone and affect temperature readings. Turning to Darringer, the patentee asserted that the reference did not teach or suggest the "means for causing said at least one laser beam to outline said energy zone." In other words, Darringer only projected a single laser beam into the center of the energy zone. When combined, Darringer and JP 62-12848 would compound the problem. For that reason, Omega affirmed that "the simple substitution of a laser beam for an incandescent light source [**32] is not, as maintained by the Examiner, an obvious substitution but offers far superior results."

Consequently, during the prosecution of the application that issued as the '880 patents, Omega repeatedly insisted that its invention differed from the prior art by precluding appreciable heat from entering the energy zone and affecting the temperature of the energy zone. By insisting that its invention directs energy in a way that does not affect temperature measurement, the patentee has rejected the examiner's broad assessment of the claim scope and stated in a public record what his invention could not be. That statement is a deliberate surrender of claim scope, unmistakable in its effect because it is not suitable to multiple interpretations as in *Northern Telecom*, 215 F.3d at 1294, 55 USPQ2d at 1075. There is only one possible interpretation of this clear statement: The inventions covered by claims 1 and 3 have significantly reduced effect on temperature measurement.

Since the patentee offered a narrower construction of

the verb "to visibly outline" in the disputed function, it has clearly and unmistakably disclaimed the territory between the full ordinary meaning [**33] of the claim language and the asserted new meaning. The claimed function, as stated in claims 1 and 3, must not add appreciable heat to the energy zone as to affect the accuracy of the temperature measurement. The district court was therefore correct in finding prosecution disclaimer, but erred in ascertaining the scope of the disavowal. See Part III.A., *supra*.

In sum, based on our consideration of the district court's analysis and our plenary review of the intrinsic evidence, we cannot agree with the trial court's interpretation of the function performed by the "means for causing." There is no support in the specification or the prosecution history for the district court's negative limitation [**1328] that would preclude the projection of light into the interior or the center of the energy zone. Rather, we must give the claim language its presumptive full ordinary meaning, limited solely by the patentee's clear and unmistakable disclaimer. Therefore, we conclude that the claimed function is the causing of at least one laser beam to strike the periphery of the energy zone for visibly outlining the entire energy zone, without adding appreciable heat to the energy zone as to affect the [**34] accuracy of the temperature measurement.

C

Having determined the function performed by the "means for causing," we must now ascertain the corresponding structures which perform those functions. *Cardiac Pacemakers*, 296 F.3d at 1113, 63 USPQ2d at 1730. A corresponding structure must be clearly linked to the claimed function. *B. Braun Med.*, 124 F.3d at 1424-25, 43 USPQ2d at 1900.

The specification of the '880 patent discloses numerous corresponding structures, clearly linked to the claimed function by statements such as "direct the laser beam about the perimeter of the energy zone," '880 patent, col. 6, ll. 25-26, or "thereby permitting the laser beam 114 to rotate about the periphery of the energy zone E to make it visible to the user of the radiometer 10," *id.*, col. 6, ll. 49-51.

Guided by those "clearly linking" statements, we have associated the following disclosed structures to the "means for causing," and list them according to the corresponding figures discussed in the specification.

Figures 2 and 3 depict the use of the motive means, *id.*, col. 6, ll. 9-11 and 45, the vibratory means, or the application of a magnetic field, *id.* [**35], col. 6, ll. 13-15 and 46-47, to rotate the laser beam. Figure 4 also shows a magnetic field applied to rotate the laser beam around the periphery of the energy zone, *id.*, col. 6, ll. 53-59. In the embodiment shown in figure 6, a combination of a pivot bearing, connecting arm and attached motor rotates the laser beam, *id.*, col. 7, ll. 7-10, while optical fibers effect the desired function in the embodiment of figures 7 and 10, *id.*, col. 7, ll. 14-20 and 41-49. A combination of a rotating flat mirror and motor performs that function in the embodiment of figure 8, *id.*, col. 7, ll. 24-29, whereas an arrangement of motor, slip rings, counterweights, screw adjustments and pivot point produces the desired effect in the embodiment shown in figures 11 and 12, *id.*, col. 7, l. 50 - col. 8, l. 15 and col. 8, ll. 26-36. Finally, the text discussing figure 13 describes a combination of motor, slider, swivel ball and swivel seat as the corresponding structures, *id.*, col. 8, ll. 52-62.

D

Having construed the disputed claims, we must now ascertain whether the district court properly granted summary judgment of noninfringement of claims 1 and 3 of the '880 patent. On that [**36] point, we must answer in the negative.

Indeed, triable issues of fact, not amenable to appellate determination on first instance, remain in this case. As a question of fact, literal infringement of a § 112, P 6 limitation requires that the relevant structure in the accused device perform the identical function recited in the claim and be identical or equivalent to the corresponding structure in the specification.² *Odetics, Inc. v. Storage Tech. Corp.*, 185 F.3d 1259, 1268-69. [*1329] 51 USPQ2d 1225, 1229-31 (Fed. Cir. 1999). Functional identity and either structural identity or equivalence are both necessary. *Id.*, 51 USPQ2d at 1229-30. Because we have rectified the district court's construction of the claimed function and clarified the corresponding structures, the summary judgment of noninfringement cannot stand since the conclusion regarding the lack of functional identity is no longer necessarily true. Under the correct construction of its function, the "means for causing" is no longer prohibited from projecting its laser beams into the interior of the energy zone; it must only avoid adding appreciable heat to the energy zone as to

affect the accuracy [**37] of the temperature measurement.

2 Because Omega did not pursue any argument that Raytek infringed the '880 patent under the doctrine of equivalents, we limit our discussion to literal infringement.

In this case, the parties agree that the accused devices project a single laser beam into the center of the energy zone, but dispute whether that laser beam adds any appreciable heat to the zone. In fact, in response to Raytek's motion for summary judgment, Omega proffered two expert declarations, both asserting that any heat added by a central laser was inconsequential and did not affect the temperature reading. Because a reasonable jury might reach different conclusions when faced with this evidence, we must conclude that a triable issue of fact remains in this case and must therefore reverse the summary judgment of noninfringement of claims 1 and 3 of the '880 patent.

IV

We now turn to the summary judgment that claims 16 and 18 of the '880 patent were not infringed. Claim 16, on which claim 18 is dependent, calls [**38] for a "means for causing said at least one laser beam to identify and define both the center and only the periphery of said energy zone," and the parties agree that those claims fall within the ambit of § 112, P 6.

A

Because these claims are in means-plus-function format, we commence our plenary review by addressing the district court's construction of the claims' function. *Micro Chem.*, 194 F.3d at 1258, 52 USPQ2d at 1263. Faced with the requirement that the laser beam strikes both the periphery and the center of the energy zone, the trial court rejected the possibility that the laser could simultaneously define and identify the center and the periphery of the energy zone. Instead, the district court required that the laser beam strike those points sequentially. We cannot agree.

It is axiomatic that, unless expressly compelled by the intrinsic evidence, courts must avoid the addition of a novel limitation. See *Wenger Mfg.*, 239 F.3d at 1233, 57 USPQ2d at 1684 ("Under § 112, P 6, a court may not import functional limitations that are not recited in the

claim, or structural limitations from the written description that are unnecessary to perform [*39] the claimed function."). In reaching its interpretation of claims 16 and 18, the district court improperly imposed an additional limitation that has no support in the wordings of the claims, the written description or the prosecution history.

Indeed, the text of the claims themselves does not substantiate that construction. Claims 16 and 18 differ from claims 1 and 3 by requiring that, in addition to striking the periphery of the energy zone, the laser beam must also identify the zone's center. Compare '880 patent, col. 9, ll. 39-41, with *id.*, col. 10, ll. 31-33. The claims' language is, however, silent on whether the laser beam must strike the center and the periphery either sequentially or simultaneously. And neither word is necessary to the performance of the claimed function. There is thus no basis in the text of the claims for adding a new limitation, be it the adjective "simultaneous" or "sequential."

The district court justified the addition of the "sequential" limitation by reference [*1330] to two preferred embodiments in the written description. Specifically, the trial court determined the function by first searching for the corresponding structures, finding those structures [*40] in figures 11 and 12. We find that justification inadequate, because such a reasoning turns our rule of construction for means-plus-function claims upside down. The district court's approach essentially starts with a structure, and defines the function in light of that structure. Our case law, however, requires the exact opposite procedure: In construing means-plus-function claims, courts must first identify the claimed function using traditional tools of claim construction and then determine the structure corresponding to the identified function. See *Micro Chem.*, 194 F.3d at 1258, 52 USPQ2d at 1263. Consequently, the additional limitation has no support in the patent's specification.

Nor does the prosecution history validate that ruling. According to the district court and Raytek, the addition of the word "only" before "the periphery" during the prosecution of the '880 patent indicated "the concept that the energy field was not to be the target of the laser beam, but merely the periphery." In other words, the trial court read the addition of the term "only" as tantamount to a disclaimer of nonsimultaneity. This alleged prosecution disclaimer does not, however, rise [*41] to the level of

being unmistakable. Although Omega added the word "only" by amendment to overcome the Everest and JP 62-12848 references cited by the examiner, the basis for that amendment is reasonably amenable to more than one explanation. Perhaps, as Omega suggests, the patentee made the amendment to prevent the projected light from illuminating the entire energy zone, as taught by Everest and JP 62-12848, by requiring a space between the central laser beam and the laser striking the periphery. Or it could be any number of other unstated but reasonable rationales unrelated to the issue of simultaneity. As in *Northern Telecom*, there is more than one reasonable basis for the amendment, rendering the intent underlying the amendment ambiguous and thus negating the possibility of the disclaimer being unmistakable. Consequently, there is no ground for adding a "sequential" limitation or for excluding the concept of simultaneity.

In sum, we reject the imposition of a "sequential" limitation to the function of claims 16 and 18, because that restriction finds no support in the intrinsic evidence. Given its full ordinary meaning, the laser beam in those two claims may strike the center [*42] and periphery of the energy zone either sequentially, simultaneously, or otherwise.

B

We must now consider whether the disclaimer attaching to claims 1 and 3 of the '880 patent also applies to claims 16 and 18 of the same patent, as argued by Raytek. We note that the patentability of claims 16 and 18 stands on their own merit, as the patentee has not tied the fate of those claims to claim 1 and 3, as it has done for the '678 and '679 patents. See *Parts V.A. and VI.A., infra*. Since the doctrine of prosecution disclaimer is inextricably tied to the arguments, amendments or concessions made by the patentee during prosecution, our analysis must necessarily begin with the prosecution history of claims 16 and 18.

During prosecution of the '880 patent, the examiner rejected claims 1 through 15 as obvious based on Everest, Darringer and JP 62-12848. In response, Omega argued that those claims did not add substantial heat to the energy zone. As part of that response, the patentee also added nine new claims, including claims 16 and 18. There was no argument or substantive [*1331] comment on the newly added claims; Omega directed all of its effort on overcoming the rejection of claims 1 through

[**43] 15.

Subsequently, Omega and the examiner had four telephonic interviews over the space of a week in February of 1997, culminating *inter alia* in the patentee's voluntary addition of the word "only" to the "means for causing" in claim 16. As a result of that addition, claim 16 and its dependent claim 18 now "identify and define both the center and *only* the periphery of the said energy zone." The Examiner Interview Summary Record provided a short explanation for that voluntary amendment:

Claims 1, 8, 9, 11, 12, 15, 16, 22, 24 were amended to clearly define the invention over the prior art of the record [i.e., Everest and JP 62-12848]. Applicant will submit a new terminal disclaimer. The changes to the claims will be submitted in a Supplemental Amendment.

Because the examiner deemed it unnecessary for the applicant to provide a separate record of the substance of the interview, Omega's Supplemental Amendment only contained this cryptic statement: "Responsive to numerous telephone conversations with the Examiner, please amend the above identified application as follows." Except for the changes to the claims' text, Omega did not provide any reason for the amendments.

[**44] Although the outcome of the changes on the claims' text is unmistakable, its effects and reasons are at best ambiguous. As we explained above, *see* Part IV.A., *supra*, the addition of the term "only" has multiple reasonable bases and is therefore insufficient to tax the patentee with a disavowal of either the central laser beam or the injection of heat into the energy zone. Nor can such disclaimers be drawn from the mere statements "responsive to numerous telephone communications with the Examiner" and "to clearly define the invention over the prior art." To conclude otherwise would require an ungrounded leap of logic, requiring us to assume that the clear definition of the invention means an unequivocal disclaimer of the addition of heat into the energy zone or even a surrender of the central laser beam specifically recited by the claim's text. Neither logic nor justice permits such a leap.

Moreover, we decline to vest claims 16 and 18 with the disavowal attached to claims 1 and 3. The prosecution

disclaimer arose from the patentee's arguments regarding the term "to outline" present in claims 1 and 3. However, neither claim 16 nor 18 contains the term "to outline" or equivalent [**45] terms. And the patentee did not direct any of its disavowing arguments or comments to claims 16 and 18; they were all focused on overcoming the rejection of claims 1 through 15. Without the common term "to outline" or an indication by the patentee that the disavowal should also cover the newly added claims, there is no ground upon which a prosecution disclaimer may rest.

Consequently, there is no clear and unmistakable disclaimer attached to claims 16 and 18 of the '*880 patent*. As to those two claims, the patentee has neither disavowed a central laser beam nor the injection of heat into the energy zone.

C

We must now ascertain the disclosed structures corresponding to the function identified in claims 16 and 18. The written description of the '*880 patent* discusses a laser beam striking the center of the energy zone only once, when it describes the functioning of the single laser in figures 11 and 12. '*880 patent*, col. 8, ll. 19-25. In that discussion, the specification clearly links the function of outlining the periphery of the energy zone with [*1332] a combination of motor, slip rings, counterweights, screw adjustments and pivot point. *Id.*, col. 7, l. 50 - col. 8, l. 14, and col. [**46] 8, ll. 26-36. That combination of equipment causes the laser to outline the zone by rotating around the pivot point, and to return to "the center of the target" once the motor is turned off. *Id.*, col. 8, ll. 21-26. Omega concedes that this combination provides the only corresponding structure expressly discussed in the specification that both identifies the center and also outlines the energy zone.

Despite that concession, Omega also contends that one of skill in the art would understand that lenses, prisms, and laser beam splitting device are disclosed structures corresponding to the claimed means. That argument is unavailing for two reasons. First, those structures are not clearly linked to the function recited in claims 16 and 18. Although the splitting device, lenses, and prisms appear in the '*880 patent*, *see id.*, col. 6, ll. 19-25 and col. 7, ll. 1-2, the specification does not clearly associate those structures with the claimed function. Indeed, the sole function expressly performed by those structures is to cause the laser beam to outline the

periphery of the energy zone; there is no description at all that the laser beam could strike the center of the energy zone. [**47] *Id.* Unless the structures are clearly associated with the claimed function, they cannot be corresponding structures for purposes of § 112, P 6. See *B. Braum Med.*, 124 F.3d at 1424-25, 43 USPQ2d at 1900. Second, Omega impermissibly relies on expert declarations to clearly link the claimed function and the laser splitting device, lenses, and prisms. Although expert testimony and declarations are useful to confirm that the construed meaning is consistent with the denotation ascribed by those in the field of the art, *Pitney Bowes, Inc. v. Hewlett-Packard Co.*, 182 F.3d 1298, 1309, 51 USPQ2d 1161, 1168 (Fed. Cir. 1999), such extrinsic evidence cannot be used to vary the plain language of the patent document. *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1584, 39 USPQ2d 1573, 1577 (Fed. Cir. 1996). Yet, Omega submits its expert declarations not to shed light on this field of art, but to rewrite the patent's specification and explicitly provide for the laser splitting device, lenses, and prisms to strike the center of the energy zone. That we cannot accept. See *id.*

Accordingly, the laser splitting device, lenses, and prisms [**48] are not corresponding structures to the "means for causing" function in claims 16 and 18. Only the combination of motor, slip rings, counterweights, screw adjustments and pivot point is clearly linked to that function.

D

As for claims 1 and 3 above, we must also reverse the grant of summary judgment of noninfringement regarding claims 16 and 18. We have corrected the district court's construction of the claimed function, casting doubt on the determination of no functional identity upon which the district court relied. Because of our correction and the evidence submitted by Omega to overcome the summary judgment motion, see Part III.D., *supra*, triable issues of fact now exist.

V

Having resolved the dispute surrounding the '880 patent, we now turn to the summary judgment that Raytek does not infringe the '678 patent. Because the district court erred in its claim construction, we reverse.

A

Not drafted in means-plus-function format, the fourteen asserted claims of the '678 patent all require the laser beams "to outline" the energy zone or its [*1333] periphery.³ See '678 patent, col. 10-12. In its construction of that term, the district court repeated the error it made in [**49] interpreting the function in claims 1 and 3 of the '880 patent: it added a negative limitation which precluded any projection of light into the interior or center of the energy zone.

3 Except for independent claim 7, all the asserted claims of the '678 patent include the limitation "to outline." Claim 7 requires that the laser beams "identify the extent of said radiation zone." '678 patent, col. 11, ll. 41-42. Because the district court and the parties treated the limitation in claim 7 as an equivalent of "to outline," tying their fates together, we shall do the same.

That was error. In narrowing the '678 patent claims, the district court relied on the same reasons it used to add a negative limitation to the function disclosed by claims 1 and 3 of the '880 patent. Outside of the means-plus-function context and given the similarity between these related patents, those reasons are even more clearly flawed. As we explained above, neither the plain text of the claims, the specification, nor the file wrapper justifies [**50] the imposition of this negative limitation. See Part III.A., *supra*. Consequently, because there is no support in the intrinsic evidence for the district court's departure from the claims' ordinary meaning, we cannot sustain its claim construction.

B

We agree with Raytek that the disclaimer from the prosecution of claims 1 of the '880 patent attaches to the construction of the '678 patent and narrows the broad scope of the asserted claims. Despite Omega's assertions to the contrary, prosecution disclaimer may arise from disavowals made during the prosecution of ancestor patent applications. See *Advanced Cardiovascular Sys., Inc. v. Medtronic, Inc.*, 265 F.3d 1294, 1305, 60 USPQ2d 1161, 1168-69 (Fed. Cir. 2001) ("The prosecution history of a related patent can be relevant if, for example, it addresses a limitation in common with the patent in suit."); *Elkay Mfg. Co. v. Ebeco Mfg. Co.*, 192 F.3d 973, 980, 52 USPQ2d 1109, 1114 (Fed. Cir. 1999) ("When multiple patents derive from the same initial application, the prosecution history regarding a claim limitation in any patent that has issued applies with equal force to

subsequently issued patents [*51] that contain the same claim limitation."). As long as the same claim limitation is at issue, prosecution disclaimer made on the same limitation in an ancestor application will attach. *Augustine Med., Inc. v. Gaymar Indus., Inc.*, 181 F.3d 1291, 1300, 50 USPQ2d 1900, 1907 (Fed. Cir. 1999) ("The prosecution of a parent application may limit the scope of a later application using the same claim term.").

Omega attempts to avoid this doctrine by citing *Advanced Cardiovascular* as shielding continuations-in-part from narrowing disavowals made in parent applications. Our precedent holds to the contrary, indicating that an interpretation asserted in the prosecution of a parent application can also affect continuation applications. *Elkay*, 192 F.3d at 980, 52 USPQ2d at 1114, continuation-in-part applications, *Wang Labs., Inc. v. Am. Online, Inc.*, 197 F.3d 1377, 1384, 53 USPQ2d 1161, 1165 (Fed. Cir. 1999) ("This subject matter is common to the continuation-in-part application, and argument concerning the [prior art] reference was correctly viewed as applying to the common subject matter."), and even related continuation-in-part applications [*52] arising from the same parent. *Jonsson v. Stanley Works*, 903 F.2d 812, 818, 14 USPQ2d 1863, 1869 (Fed. Cir. 1990) (holding that when two patents issued from continuation-in-part applications [*1334] derived from one original application, the prosecution history of a claim limitation in the first patent to issue was properly applied to the same claim limitation in the second patent to issue). Consequently, that the '678 patent is a continuation-in-part of the '880 patent does not shield it from narrowing disclaimers made during the prosecution of a parent application.

Moreover, Omega misunderstands *Advanced Cardiovascular*, which distinguished *Wang Labs* and *Jonsson*, because, in *Advanced Cardiovascular*, "there are no common claim terms in dispute." *Advanced Cardiovascular*, 265 F.3d at 1305-06, 60 USPQ2d at 1169. As we emphasized in that case:

Indeed, the present case involves the absence of a claim term. The patentee's whole point in filing the application that resulted in the '233 patent was to secure broader claims. As Medtronic admits in its opening brief, "none of the '233 Patent claims explicitly state the guidewire tube

runs inside [*53] a balloon catheter [which is the disputed claim]."

Id. at 1306, 60 USPQ2d at 1169. Contrary to *Advanced Cardiovascular*, there is a common term in dispute here. The disputed term "to outline" is the same throughout all five patents in the genealogy, including the '880 and '678 patents. The patentee made a clear and unmistakable disclaimer of claim scope in its prosecution of the parent '880 patent, and we presume, unless otherwise compelled, that the same claim term in the same patent or related patents carries the same construed meaning. See *Fin Control Sys. Pty, Ltd. v. OAM, Inc.*, 265 F.3d 1311, 1318, 60 USPQ2d 1203, 1208 (Fed. Cir. 2001). *Advanced Cardiovascular* is thus inapposite; rather, *Jonsson* and *Wang Labs* control the disposition of this case.

Without any basis for the district court's negative limitation, we must give the term "to outline" its presumptive denotation of "[t]o draw a line that marks the outer limits of an object or figure." See *Webster's*, *supra*, at 1602. However, because prosecution disclaimer made in the '880 patent extends to the '678 patent, we rule that any energy directed inside the energy [*54] zone cannot add appreciable heat to the energy zone as to affect the accuracy of the temperature measurement.

C

Because we have corrected the district court's construction of the disputed claim limitation and in light of the expert declarations submitted by Omega to overcome the summary judgment motions, triable issues of facts regarding Raytek's central laser beam remain. We therefore reverse the grant of summary judgment regarding the '678 patent and remand for further proceedings.

VI

We now address the summary judgment that Raytek does not infringe the '679 patent and that claims 33 and 41 of that patent were invalid for indefiniteness. This patent is a continuation in part of the '678 patent, and all 51 asserted claims⁴ cover either a method or an apparatus which uses at least three laser beams "to outline" the energy zone.⁵ Of the 51 asserted claims, six of those claims-- [*1335] claims 20, 26-28, 32, and 53--are drafted in means-plus-function format.

4 Although the '679 patent contains 53 claims which were all asserted in the complaint, the parties subsequently submitted a stipulation withdrawing claims 15 and 16 from the litigation. We will consequently not address those withdrawn claims.

[**55]

5 Although some of the claims of the '679 patent use phrases akin to the term "to outline," the district court and the parties treated those analogous phrases as equivalents to the term "to outline," tying their fates together. We will therefore do the same.

A

As with all infringement and invalidity analyses, we commence our inquiry with the construction of the claims in suit. *TurboCare*, 264 F.3d at 1120, 60 USPQ2d at 1024; *SIBIA Neurosciences, Inc. v. Cadus Pharm. Corp.*, 225 F.3d 1349, 1355, 55 USPQ2d 1927, 1930 (Fed. Cir. 2000) ("The first step in any invalidity analysis is claim construction, an issue of law that this court reviews de novo."). In construing the non-means-plus-function claims, the district court adopted the same negative limitation as for the '678 patent, precluding any projection of light into the interior or center of the energy zone. The trial court expressly based that ruling on the same reasons it gave in connection with the '678 patent. Since we deemed those grounds inadequate to impose the negative limitation in the '678 patent, it [**56] is equally true that those reasons will not form the requisite bases for construing the '679 patent. Unless otherwise compelled, the claims receive their ordinary and accustomed meaning.⁶

6 We note that the district court's claim construction inevitably required the invalidation of claims 33 and 41, in contradiction to the canon that courts should attempt to construe claims to preserve their validity. See *Wang Labs., Inc. v. Am. Online, Inc.*, 197 F.3d 1377, 1383, 53 USPQ2d 1161, 1165 (Fed. Cir. 1999). Since the intrinsic evidence did not compel the invalidating construction, the district court thus erred.

As with the '678 patent, the disclaimer made by the patentee during the prosecution of the '880 patent flows down to the '679 patent. Indeed, the '679 patent is a continuation in part of the '678 patent, and it is settled that prosecution disclaimer attaches to progeny

continuation in part applications where the same claim limitation is at issue. See *Advanced Cardiovascular*, 265 F.3d at 1305, 60 USPQ2d at 1168-69; [**57] *Wang Labs.*, 197 F.3d at 1380, 53 USPQ2d at 1165; *Jonsson*, 903 F.2d at 818, 14 USPQ2d at 1869. Consequently, because the prosecution disclaimer made in the '880 patent extends to the '679 patent, we conclude that any energy directed inside the energy zone cannot add appreciable heat to the energy zone as to affect the accuracy of the temperature measurement.

As to the claims of the '679 patent written in means-plus-function format, the district court imposed a negative limitation on the function contained in those claims as it did for claims 1 and 3 of the '880 patent. As the reason for that determination, the district court referred to the analysis provided for claim 1 of the '679 patent. Having deemed that reasoning erroneous, we similarly correct the interpretation of the function in those means-plus-function claims and clarify that the claim language does not preclude light from striking the interior of the energy zone, although prosecution disclaimer precludes the addition of appreciable heat to the energy zone as to affect the accuracy of the temperature measurement.

B

The district court granted summary judgment of noninfringement as to the [**58] '679 patent based on its erroneous claim construction. Since we have now corrected the claim construction and in light of the expert declarations submitted by Omega to overcome the summary judgment motions, triable issues of fact regarding Raytek's central laser beam remain. The summary adjudication must therefore be reversed and the case remanded for factual findings.

The district court also ruled that claims 33 and 41 of the '679 patent were indefinite. [**1336] because it deemed those claims internally inconsistent. The trial court noted that those two claims expressly require a laser beam directed to the center of the energy zone, while at the same time being respectively dependent on independent claims 32 and 38 which were construed as excluding that central laser beam. Reasoning that claims 33 and 41 could not simultaneously require and preclude that central laser beam, the court concluded that one of skill in the art could not determine the scope of those claims, rendering them indefinite. Our correction of the claim construction has now removed the improper

negative limitation and thus negated the inherent contradiction identified by the district court. Accordingly, we reverse the [**59] summary adjudication that claims 33 and 41 of the '679 patent are invalid for indefiniteness.

CONCLUSION

We reverse the grants of summary judgment that

Raytek does not infringe the patents in suit and that claims 33 and 41 of the '679 patent are indefinite. Having done so, we remand these cases for further proceedings consistent with this opinion.

REVERSED AND REMANDED

LEXSEE 304 F.3D 1373

**ROSCO, INC., Plaintiff-Appellant, v. MIRROR LITE COMPANY,
Defendant-Cross Appellant.**

01-1271, 01-1302

UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

304 F.3d 1373; 2002 U.S. App. LEXIS 20206; 64 U.S.P.Q.2D (BNA) 1676

September 24, 2002, Decided

SUBSEQUENT HISTORY: [**1] Rehearing and Rehearing En Banc Denied December 5, 2002, Reported at: *2002 U.S. App. LEXIS 27299*. Rehearing denied by, Rehearing, en banc, denied by *Rosco, Inc. v. Mirror Lite Co.*, 2002 U.S. App. LEXIS 27299 (Fed. Cir., Dec. 5, 2002). On remand at, Findings of fact/conclusions of law at *Rosco, Inc. v. Mirror Lite Co.*, 2003 U.S. Dist. LEXIS 26209 (E.D.N.Y., July 8, 2003).

PRIOR HISTORY: Appealed from: United States District Court for the Eastern District of New York. Senior Judge Charles P. Sifton. *Rosco, Inc. v. Mirror Lite Co.*, 139 F. Supp. 2d 287, 2001 U.S. Dist. LEXIS 871 (E.D.N.Y., 2001).

DISPOSITION: AFFIRMED-IN-PART, REVERSED-IN-PART, VACATED-IN-PART, and REMANDED.

COUNSEL: Alfred R. Fabricant, Ostrolenk, Faber, Gerb & Soffen, LLP, of New York, New York, argued for plaintiff-appellant. With him the brief was Max Moskowitz.

John A. Artz, Artz & Artz, P.C., of Southfield, Minnesota, argued for defendant-cross appellant. With him on the brief were John S. Artz and Robert P. Renke.

JUDGES: Before LOURIE, Circuit Judge, PLAGER, Senior Circuit Judge, and DYK, Circuit Judge.

OPINION BY: DYK

OPINION

[*1376] DYK, Circuit Judge.

Rosco, Inc. ("Rosco") appeals the decision of the United States District Court for the Eastern District of New York finding Rosco's design patent, United States Design Patent No. 346,357 ("the '357 patent"), invalid as functional and obvious, finding that Rosco abandoned its claim that Mirror Lite Company ("Mirror Lite") inequitably procured its utility patent, *United States Patent No. 5,589,984* ("the '984 patent"), and rejecting Rosco's claims under 15 U.S.C. § 1125(a) of tortious interference with business relations, misrepresentation, [**2] and common law trademark infringement. *Rosco, Inc. v. Mirror Lite Co.*, 139 F. Supp. 2d 287 (E.D.N.Y. 2001). Mirror Lite cross-appeals the district court's decision that the claims of the '984 patent are invalid. Because the district court erred in finding the '357 patent invalid as functional and obvious; finding the claims of the '984 patent invalid under 35 U.S.C. §§ 102(e) and 102(g); and finding that Rosco abandoned its inequitable conduct claims, we reverse in part, vacate in part, and remand. On remand, the district court should make findings and conclusions on all relevant issues as required by *Federal Rule of Civil Procedure 52*, *Fed. R. Civ. P. 52*. We affirm the district court's rejection of Rosco's claims under 15 U.S.C. § 1125(a) of misrepresentation and common law trademark infringement.

BACKGROUND

Rosco and Mirror Lite are competitors in the school bus mirror market. This dispute involves "cross-view" mirrors, which are convex, three-dimensional, curved surface mirrors mounted on the front fender of a school bus, enabling the bus driver to view the front and passenger side of a school bus. Rosco filed a complaint

[**3] on November 19, 1996, and amended the complaint on December 27, 1996 (the "Rosco I case"). A second civil action was subsequently filed by Rosco in October 1999 (the "Rosco II case"). Mirror Lite asserted a counterclaim in the second action. The two cases were consolidated.

Each party owns a patent that it alleged was infringed by the other. Rosco raised a variety of other claims.

1. Rosco's '357 Design Patent

Rosco's '357 design patent relates to an oval, highly convex cross-view mirror with a black, flat metal backing. Rosco applied for the patent on April 14, 1992, and the patent issued on April 26, 1994. Rosco alleged that Mirror Lite infringed the '357 design patent. Mirror Lite argued that the '357 design patent was invalid as functional and therefore was not infringed.

2. Mirror Lite's '984 Utility Patent

Mirror Lite's '984 utility patent relates to an oval cross-view mirror with a varying radius of curvature along the major axis of the convex ellipsoid mirror lens. Mirror Lite filed the patent application that led to the '984 patent on September 9, 1992. The '984 patent issued on December 31, 1996. Rosco requested declaratory judgment that all claims of the '984 patent [**4] were invalid as anticipated under 35 U.S.C. § 102(a), invalid for failure to name the true inventor under 35 U.S.C. § 102(f), invalid as previously invented by another under 35 U.S.C. § 102(g), and unenforceable due to Mirror Lite's inequitable conduct in procuring the patent.¹ Mirror Lite counterclaimed that Rosco infringed the '984 patent.

1 The district court deemed Rosco's complaint amended to add claims of patent invalidity under 35 U.S.C. § 102(e) (inherently anticipated by prior art) and 35 U.S.C. § 103 (invalid as obvious). *Rosco*, 139 F. Supp. 2d at 300.

[*1377] 3. Rosco's Other Claims

Rosco also alleged that Mirror Lite: engaged in tortious interference with business relations by procuring the '984 patent (through inequitable conduct; engaged in misrepresentation by publishing disparaging statements about Rosco's mirrors; and engaged in common law

trademark infringement by using [**5] the marks "Eagle Eye" and "Mini Eagle Eye" to compete with Rosco's "Hawk Eye" and "Mini Hawk Eye" products.

In the Rosco I case, Mirror Lite moved for summary judgment on all claims, and the district court granted summary judgment as to Rosco's claim of tortious interference with business relations. *Rosco*, 139 F. Supp. 2d at 294-95. The court denied Rosco's motion for reconsideration on August 19, 1999. *Id.* However, the court later effectively granted reconsideration and reinstated the claim of tortious interference with business relations. *Id.* at 304 n.14.

After a bench trial, the district court: found the '357 design patent invalid as functional and obvious under 35 U.S.C. § 103; found the claims of the '984 patent invalid under 35 U.S.C. §§ 102(e) and 102(g); did not reach Rosco's claim for design patent infringement because it found the '357 patent invalid; did not reach Mirror Lite's claim of patent infringement because it found the '984 patent claims invalid; did not address the validity of the '984 patent under 35 U.S.C. §§ 102(a), 102(f), and 103; found that Rosco abandoned [**6] its inequitable conduct claims; and rejected Rosco's claims of misrepresentation and common law trademark infringement.

The parties timely appealed. We have jurisdiction under 28 U.S.C. § 1295(a)(1).

DISCUSSION

This case presents an example of the need for clear findings of fact and conclusions of law. *Federal Rule of Civil Procedure 52(a)* requires that "in all actions tried upon the facts without a jury or with an advisory jury, the court shall find the facts specially and state separately its conclusions of law thereon." *Fed. R. Civ. P. 52(a)*. We have noted the importance of compliance with these requirements, recognizing that one of the purposes of *Rule 52(a)* is to "provide the appellate court with an adequate basis for review." *Giechter v. Davidson*, 116 F.3d 1454, 1458, 43 U.S.P.Q.2D (BNA) 1030, 1033 (*Fed. Cir.* 1997); see also *Pretty Punch Shoppettes, Inc. v. Hank*, 844 F.2d 782, 784, 6 U.S.P.Q.2D (BNA) 1563, 1565 (*Fed. Cir.* 1988) ("The trial court must provide sufficient factual findings such that we may meaningfully review the merits of its order."). Here, the district court failed in several instances to make sufficient findings of fact [**7] and conclusions of law to provide the

necessary predicate for judicial review.

We note also that the parties in this case have made prolix, confusing, and contentious arguments, which no doubt made it particularly difficult for the district court to address the issues with clarity and precision. We trust that, on remand, counsel will provide the necessary assistance to the district court by appropriately narrowing the issues and coherently explaining their respective positions.

I Rosco's '357 Design Patent

"A patent shall be presumed valid." 35 U.S.C. § 282 (2000). To overcome this presumption of validity, the party challenging a patent must prove facts supporting a determination of invalidity by clear and convincing evidence. *Apotex USA, Inc. v. Merck & Co.*, 254 F.3d 1031, 1036, 59 U.S.P.Q.2D (BNA) 1139, 1142-43 (Fed. Cir. 2001), cert. denied, 534 U.S. 1172, 152 L. Ed. 2d 136, [*1378] 122 S. Ct. 1196 (2002) (citing *Am. Hoist & Derrick Co. v. Sowa & Sons, Inc.*, 725 F.2d 1350, 1360, 220 U.S.P.Q. (BNA) 763, 770 (Fed. Cir. 1984)).

Rosco's '357 design patent shows a highly convex, curved-surface, three-dimensional oval mirror with a black, flat metal [**8] backing. In May 1992, Rosco began manufacturing the mirror of the '357 patent under the name "Eagle Eye."

Rosco alleged that Mirror Lite infringed the '357 patent by manufacturing and selling a duplicate of Rosco's mirror under the name "Hawk Eye." Mirror Lite argued that the '357 patent was invalid as functional. The district court found the '357 design patent invalid as functional. *Rosco, 139 F. Supp. 2d at 296.*

We apply a stringent standard for invalidating a design patent on grounds of functionality: the design of a useful article is deemed functional where "the appearance of the claimed design is 'dictated by' the use or purpose of the article." *L.A. Gear, Inc. v. Thom McAn Shoe Co.*, 988 F.2d 1117, 1123, 25 U.S.P.Q.2D (BNA) 1913, 1917 (Fed. Cir. 1993) (citing *In re Carletti*, 51 C.C.P.A. 1094, 328 F.2d 1020, 1022, 140 U.S.P.Q. (BNA) 653, 654 (CCPA 1964)). "The design must not be governed solely by function, i.e., that this is not the only possible form of the article that could perform its function." *Seiko Epson Corp. v. Nu-Kote Int'l, Inc.*, 190 F.3d 1360, 1368, 52 U.S.P.Q.2D (BNA) 1011, 1017 (Fed. Cir. 1999). "When there are several [*9] ways to achieve the function of an

article of manufacture, the design of the article is more likely to serve a primarily ornamental purpose." *L.A. Gear, 988 F.2d at 1123*, 25 U.S.P.Q.2D at 1917 (citations omitted). That is, if other designs could produce the same or similar functional capabilities, the design of the article in question is likely ornamental, not functional. Invalidity of a design patent claim must be established by clear and convincing evidence. *Id.*

The district court found that because the mirror's oval shape, the asserted point of novelty of the '357 patent, "of necessity dictates its function," the '357 patent was invalid as functional. ² *Rosco, 139 F. Supp. 2d at 296.* The court based its determination of functionality on its findings that the mirror of the '357 patent offered a unique field of view (when compared to Mirror Lite's Bus Boy mirror); that Rosco represented to the Patent and Trademark Office that its mirror provided a superb field of view; and that Rosco marketed the mirror of the '357 patent as more "aerodynamic" than other cross-view mirrors. *Id.*

2 The district court's finding in this respect appears to be inconsistent with its earlier summary judgment decision, in which it noted: "A review of the other cross-over mirrors on the market reveals that several different styles of cross-over mirrors exist It cannot be said that the oval shape and flat backing are dictated by function." *Rosco, Inc. v. Mirror Lite Co.*, No. CV-96-5658, at 15 (E.D.N.Y. June 2, 1999) (order granting summary judgment in part).

[**10] The mere fact that the invention claimed in the design patent exhibited a superior field of view over a single predecessor mirror (here, the Bus Boy) does not establish that the design was "dictated by" functional considerations, as required by *L.A. Gear*. The record indeed reflects that other mirrors that have non-oval shapes also offer that particular field of view. Similarly, nothing in the record connects the oval shape of the patented design with aerodynamics, and the record shows that other non-oval shaped mirrors have the same aerodynamic effect.

Mirror Lite has not shown by clear and convincing evidence that there are no designs, other than the one shown in Rosco's [*1379] '357 patent, that have the same functional capabilities as Rosco's oval mirror. Under these circumstances it cannot be said that the claimed design of the '357 patent was dictated by

functional considerations. We reverse the district court and hold that the '357 patent claim was not shown to be invalid on functionality grounds.

Independent claim 1 provides:

A mirror assembly, comprising:

(a) a mirror lens having a reflective outer surface and a non-reflective rear surface, the mirror lens comprising a mirror body which terminates in an oval perimetral edge, the edge surrounds the reflective surface and the non-reflective surface of the mirror lens, the mirror body being a substantially convex ellipsoid having a major axis and a minor axis which intersects with [*13] the major axis, the major axis having a varying radius of curvature, which radius decreases from the intersection with the minor axis to the perimetral edge.

The district court in a footnote further found the '357 patent claim invalid as obvious, stating simply that "the '357 Patent is invalid as obvious." *Rosco, 139 F. Supp. 2d at 296 n.5.* [*11] No findings to support this holding of obviousness were made. A finding of obviousness cannot be made without determining whether the invalidating prior art shows or renders obvious the ornamental features of the claimed design. *OddzOn Prods., Inc. v. Just Toys, Inc.*, 122 F.3d 1396, 1404, 43 U.S.P.Q.2D (BNA) 1641, 1646 (Fed. Cir. 1997).³ Because the district court failed to make the necessary findings as to obviousness, we remand for compliance with *Rule 52*. Should the district court find the '357 patent not invalid, the issue of whether that patent was infringed would have to be addressed by the district court.

3 See *In re Haruna*, 249 F.3d 1327, 1335, 58 U.S.P.Q.2D (BNA) 1517, 1522 (Fed. Cir. 2001) ("The obviousness of a design is determined by ascertaining whether the applicable prior art contains any suggestion or motivation for making the modifications in the design of the prior art article in order to produce the claimed design.") (quoting *Hupp v. Siroflex of Am., Inc.*, 122 F.3d 1456, 1462, 43 U.S.P.Q.2D (BNA) 1887, 1891 (Fed. Cir. 1997)); *Durling v. Spectrum Furniture Co.*, 101 F.3d 100, 103, 40 U.S.P.Q.2D (BNA) 1788, 1790 (Fed. Cir. 1996) (The inquiry under section 103 is "whether the claimed design would have been obvious to a designer of ordinary skill who designs articles of the type involved.").

[**12] II Mirror Lite's '984 Utility Patent

Mirror Lite's '984 patent claims an oval cross-view mirror with a varying radius of curvature along the major axis of the lens. Rosco sought a declaratory judgment that the '984 patent claims were invalid under 35 U.S.C. §§ 102 and 103, and that the '984 patent was unenforceable on grounds of inequitable conduct.

The district court found claims 1-3 and 6-8 of the '984 patent invalid under both 35 U.S.C. § 102(e) (invalidating claims based on anticipation by an earlier filed United States application) and 35 U.S.C. § 102(g) (invalidating claims based on prior invention "by another"). *Rosco, 139 F. Supp. 2d at 302-03.*

'984 patent, col. 4, ll. 21-31 (emphasis added). Claim 1 thus requires a "varying radius of curvature" along the major axis of the lens. Rosco argued that if the prior art disclosed the varying radius of curvature, then claim 1 is invalid. It made the same argument with respect to dependent claims 2-3 and 6-8. The district court agreed. *Rosco, 139 F. Supp. 2d at 302.*

When determining the validity of the claims of a patent, each claim must be separately considered:

[*1380] Each claim of a patent (whether in independent, dependent, or multiple dependent form) shall be presumed valid independently of the validity of other claims; dependent or multiple dependent claims shall be presumed valid even though dependent upon an invalid claim. . . . The burden of establishing invalidity of a patent or any claim thereof shall rest on the party

asserting invalidity.

finance (son); and Gertrude Englander (mother).

35 U.S.C. § 282 (2000) (emphasis added). Here, the district court found claims 1-3 and 6-8 of the '984 patent [*14] invalid without explicitly addressing and analyzing each claim, apparently addressing only independent claim 1.⁴ There is no evidence that Mirror Lite conceded that those claims stand or fall with independent claim 1. The district court erred by not separately addressing each claim, and on remand should do so. Because we find that the district court's grounds for finding invalidity are not substantiated, we need not consider the claims individually here.

4 Also, the district court failed to explicitly mention claims 4, 5, and 9, instead concluding: "the '984 patent is declared invalid." *Rosco*, 139 F. Supp. 2d at 303. On remand, the district court should consider these claims.

The district court found that the '357 patent inherently disclosed the invention of the '984 patent under 35 U.S.C. § 102(e), such that one skilled in the art would read the '357 patent as disclosing a mirror with varying radius of curvature: "the '357 Patent shows a mirror with a varying radius [*15] of curvature based on the inherent nature of such a characteristic." *Rosco*, 139 F. Supp. 2d at 301. The district court concluded that "one skilled in the art could produce the results claimed in the '984 Patent simply by practicing the '357 Patent, i.e., the result flows naturally from the express disclosures of the '357 Patent whether or not others are aware of it." *Id.* at 300. In reaching this conclusion, the district court relied on Benjamin Englander's⁵ testimony that "Rosco would have preferred to have a mirror that had a constant radius of curvature, . . . [but] the vacuum thermoforming process used to manufacture such mirrors of necessity yields a mirror with a varying radius of curvature." *Id.* at 301-02. Noting that "this evidence was not contradicted at trial," the court concluded that "anyone practicing the '357 patent by attempting to manufacture it would, on the uncontradicted evidence at trial, come up with a mirror with a varying radius of curvature." *Id.* at 301.

5 Rosco is a closely held corporation owned by the Englander family: Solomon Englander, Rosco's president (father); Benjamin Englander, Rosco's vice president of engineering (son); Daniel Englander, Rosco's vice president of

[**16] We disagree. Under the doctrine of inherency, if an element is not expressly disclosed in a prior art reference, the reference will still be deemed to anticipate a subsequent claim if the missing element "is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill." *Cont'l Can Co. v. Monsanto Co.*, 948 F.2d 1264, 1268, 20 U.S.P.Q.2D (BNA) 1746, 1749 (Fed. Cir. 1991). "Inherent anticipation requires that the missing descriptive material is 'necessarily present,' not merely probably or possibly present, in the prior art." *Trintec Indus., Inc. v. Top-U.S.A. Corp.*, 295 F.3d 1292, 1295, 63 U.S.P.Q.2D (BNA) 1597, 1599 (Fed. Cir. 2002) (quoting *In re Robertson*, 169 F.3d 743, 745, 49 U.S.P.Q.2D (BNA) 1949, 1950-51 (Fed. Cir. 1999)). The vacuum thermoforming process, however, is not specified in the '357 patent. [*1381] Thus, the question is not whether the manufacture of the mirror using this process inherently results in a varying radius of curvature along the major axis, but whether one skilled in the art would read the '357 patent as inherently disclosing the invention of the '984 patent, that is, whether one [*17] skilled in the art would read the '357 patent as showing a mirror of varying radius of curvature along the major axis. There is no evidence in the record to support a finding that one skilled in the art would so read the '357 patent. Englander's testimony only purports to establish that mirrors manufactured using the vacuum thermoforming process yield a varying radius of curvature along the major axis, but does not purport to establish that the mirror of the '357 patent can only be manufactured by that particular process. At oral argument, counsel for Rosco could not identify any evidence that one skilled in the art would read the '357 patent as inherently disclosing a mirror with varying radius of curvature along the major axis. We accordingly reverse the district court's conclusion that the '984 patent is invalid under section 102(e).

The district court also found claims 1-3 and 6-8 of the '984 patent invalid under section 102(g) in view of Rosco's pre-1992 products, finding that Rosco made the invention of the '984 patent before the '984 critical date. A patent is invalid under section 102(g)(2) if "before the applicant's invention thereof the invention was made in this country [*18] by another who had not abandoned, suppressed, or concealed it." 35 U.S.C. § 102(g)(2) (2000); *Dow Chem. Co. v. Astro-Valcour, Inc.*, 267 F.3d

1334, 1339, 60 U.S.P.Q.2D (BNA) 1519, 1522 (Fed. Cir. 2001). Prior invention by another invalidates a claimed invention under section 102(g)(2) if the prior inventor either reduced the invention to practice first, or conceived of the invention first and subsequently reduced the invention to practice. However, "it is well-settled that conception and reduction to practice cannot be established *nunc pro tunc*. There must be contemporaneous recognition and appreciation of the invention" *Estee Lauder Inc. v. L'Oreal, S.A.*, 129 F.3d 588, 593, 44 U.S.P.Q.2D (BNA) 1610, 1614 (emphasis in original) (citing *Breen v. Henshaw*, 472 F.2d 1398, 1401, 176 U.S.P.Q. (BNA) 519, 521 (CCPA 1973); see also *Dow Chem. Co. v. Astro-Valcour, Inc.*, 267 F.3d 1334, 1341, 60 U.S.P.Q.2D (BNA) 1519, 1523 (Fed. Cir. 2001)) ("There is no conception or reduction to practice where there has been no recognition or appreciation of the existence of the [invention]."). The question is whether Rosco actually recognized and [*19] appreciated a mirror with varying radius of curvature along the major axis of the lens. Though the issue is disputed, particularly with regard to trial exhibit 110, we may assume for present purposes that the earlier Rosco product did in fact have a varying radius of curvature along the major axis of the lens. But there is no evidence that this feature of the invention was recognized and appreciated.

At oral argument we requested Rosco's counsel to identify any evidence that, at the time of invention, Rosco recognized that the mirror it designed had a varying radius of curvature along the major axis, even though Rosco intended to design a mirror with *constant* curvature along the major axis that would not distort the images in the mirror lens. Counsel pointed to the testimony of Englander, who was asked: "When you came up with the idea of this oval mirror, did you have any part of your idea, did it relate to this concept of varying curvature?" Englander answered: "The varying curvature, in my mind, it was automatic because this is the process of producing these lenses which has to have, by nature, a various curvature." [*1382] Englander's testimony is self-interested and lacks corroboration. [*20] It is well established that a party claiming his own prior inventorship must proffer evidence corroborating his testimony. *Sandt Techs. Ltd. v. Resco Metal & Plastics Corp.*, 264 F.3d 1344, 1350, 60 U.S.P.Q.2D (BNA) 1691, 1694 (Fed. Cir. 2001). Englander's testimony is insufficient to constitute clear and convincing evidence that Rosco conceived the

invention of the '984 patent before the '984 critical date. We therefore reverse the district court's conclusion that the '984 patent is invalid under section 102(g).

The district court did not decide whether the '984 patent was invalid under sections 102(a), 102(f), or 103, stating that "since the '984 Patent is invalid under 35 U.S.C. § 102(e) and (g), there is no need to consider claims of its invalidity under 35 U.S.C. §§ 102(a), (f), or 103." *Rosco*, 139 F. Supp. 2d at 303 n.13. On remand, the district court should analyze the validity of each claim and should consider validity under sections 102(a), 102(f), and 103.

Finally, the district court rejected Rosco's claim that the '984 patent was unenforceable for inequitable conduct, stating that "Rosco is not entitled [*21] to judgment that the '984 patent was inequitably procured." *Rosco, Inc. v. Mirror Lite Co.*, No. CV-96-5658 and CV-99-6211, at 2 (E.D.N.Y. Feb. 21, 2001) (final judgment). The district court made no findings or conclusions supporting this result, and did not expressly consider this claim. ⁶ Again we hold that a remand is required for necessary findings and conclusions as to each claim.

6 We reject Mirror Lite's argument that the inequitable conduct issue was not properly raised.

If on remand the district court finds any of the '984 patent claims not invalid and not unenforceable, the issue of whether those claims were infringed would have to be addressed by the district court.

III Rosco's Tortious Interference Claim

Rosco stated a claim under 15 U.S.C. § 1125(a) for tortious interference with business relationships based on Mirror Lite's alleged inequitable conduct in securing the '984 patent. [A11]. In a footnote, the district court rejected this claim on the ground that [*22] it had been abandoned:

The Court informed counsel for both parties that the summary judgment opinion . . . did not dispose of Rosco's claim of tortious interference with business relations . . . and invited the parties to submit briefing on this issue. Rosco has not pursued this cause of action at all in either of its two post-trial briefs.

Therefore, the Court must consider that Rosco has abandoned this cause of action.

Rosco, 139 F. Supp. 2d at 304 n.14. At oral argument Mirror Lite, with commendable candor, agreed that this claim had not been abandoned, because Rosco had in fact briefed the issue in its post-trial brief. We agree, and remand for findings and conclusions relating to this claim based on the record established at trial.

IV Rosco's Misrepresentation Claim

The district court dismissed on summary judgment Rosco's claim that Mirror Lite engaged in unfair competition under 15 U.S.C. § 1125(a) by publishing disparaging statements about Rosco's oval mirror, *Rosco, Inc. v. Mirror Lite Co.*, No. CV-96-5658, at 30 (E.D.N.Y. June 2, 1999) (order granting summary judgment in part) and denied reconsideration. Rosco alleged [**23] that Mirror Lite misrepresented Rosco's oval mirror to consumers by publishing [*1383] various statements, such as that Rosco's mirror did not comply with federal safety standards and that school bus owners must replace their mirrors with mirrors of "identical appearance" to comply with federal safety standards. To establish misrepresentation under 15 U.S.C. § 1125(a), a plaintiff must show that the statement at issue is either (1) literally false as a factual matter, or (2) although literally true, it is likely to deceive or confuse customers. *Natl Basketball Assoc. v. Motorola, Inc.*, 105 F.3d 841, 855, 41 U.S.P.Q.2D (BNA) 1585, 1597 (2d Cir. 1997). The plaintiff must also prove that the "defendant misrepresented an 'inherent quality or characteristic' of the product." *Natl. Ass'n. of Pharm. Mfrs. v. Avert Labs.*, 850 F.2d 904, 917, 7 U.S.P.Q.2D (BNA) 1530, 1540 (2d Cir. 1988) (citation omitted).

The district court dismissed Rosco's unfair competition claim after finding these statements "literally true," and that they were not "implicitly false" so as to cause confusion. *Rosco, Inc. v. Mirror Lite Co.*, No. CV-96-5658, at 27-28 (E.D.N.Y. June 2, 1999) [**24] (order granting summary judgment in part). We affirm the district court. Rosco did not offer evidence of clear untruth or implied untruth sufficient to defeat summary judgment. We uphold the district court's grant of summary judgment as to this claim, because there is no genuine issue as to the truth of those statements.

V Rosco's Common Law Trademark Infringement Claim

The district court rejected Rosco's claim that Mirror Lite infringed its "Hawk Eye" and "Mini Hawk Eye" common law marks in violation of 15 U.S.C. § 1125(a): "Rosco has produced no evidence in the form of consumer surveys, advertising expenditure, or unsolicited media coverage that 'Hawk Eye' and 'Mini Hawk Eye' have attained secondary meaning. Nor has Rosco established a likelihood of confusion, given the sophistication of the purchasers in the school bus mirror market." 7 *Rosco*, 139 F. Supp. 2d at 303-04.

7 While Rosco's "Hawk Eye" mark was apparently a registered trademark, Rosco asserted claims under 15 U.S.C. § 1125(a), which protects unregistered marks. We therefore do not understand Rosco to have asserted a claim of trademark infringement.

[**25] Rosco asserted its claim under 15 U.S.C. § 1125(a), section 43(a) of the Lanham Act. Unregistered marks receive essentially the same protection as registered marks: "The Court interprets this section [§ 43(a)] as having created a federal cause of action for infringement of unregistered trademark or trade dress and concludes that such a mark or trade dress should receive essentially the same protection as those that are registered." *Two Pesos, Inc. v. Taco Cabana, Inc.*, 505 U.S. 763, 776, 120 L. Ed. 2d 615, 112 S. Ct. 2753 (1992) (Stevens, J., concurring). McCarthy notes: "When section 43(a) is used as a federal vehicle for assertion of traditional claims of infringement of trademarks, . . . the courts have used as substantive law the traditional rules of trademarks and unfair competition law," and concludes that "the test of liability is likelihood of confusion." 4 *McCarthy on Trademarks and Unfair Competition* § 27:18 at 27-32 (4th ed. 2002). See also *New West Corp. v. NYM Co. of Cal.*, 595 F.2d 1194, 1201, 202 U.S.P.Q. (BNA) 643, 649 (9th Cir. 1979) ("Under [§ 43(a)] the ultimate test is whether the public is likely to be [**26] deceived or confused by the similarity of the marks. . . . Whether we call the violation infringement, unfair competition or false designation of origin, the test is identical—is there a 'likelihood of confusion'?").

[*1384] To prevail on a claim for common law trademark infringement under section 1125(a), a party must show likelihood of confusion. This is required by the statute itself: section 1125(a) is triggered by a use that "is likely to cause confusion, or to cause mistake, or to deceive as to the affiliation, connection, or association"

of the user with the senior user. *15 U.S.C. § 1125(a) (2000)*. Rosco does not challenge the district court's finding that it failed to show likelihood of confusion.

Because Rosco did not show likelihood of confusion, we affirm the district court's denial of this claim. We need not address the district court's alternative ground for rejecting this claim, *i.e.*, that Rosco failed to establish secondary meaning.⁸

8 Three other claims under *15 U.S.C. § 1125* were originally asserted in the district court: Rosco alleged that Mirror Lite infringed its alleged common law trademark rights in its product numbering system; infringed the trade dress of its "Hawk Eye" mirrors; and infringed its alleged common law trademark rights in the "Eagle Eye" mark. It is not clear whether Rosco's common law trademark claim as to its product numbering system is at issue on appeal, but we find no error with the district court's rejection of that claim. As for the trade dress claim, the district court concluded that Rosco abandoned its trade dress claim in light of the Supreme Court's decision in *Wal-Mart Stores, Inc. v. Samara Brothers, Inc.*, 529 U.S. 205, 216, 146 L. Ed. 2d 182, 120 S. Ct. 1339 (2000). Rosco does not argue to the contrary. Finally, the district court found that Rosco abandoned its claim that its alleged common law trademark rights in the "Eagle Eye" mark were infringed. We do not understand this ruling to be challenged on appeal.

[**27] Finally, we have considered Mirror Lite's procedural objections and find them to be without merit.

CONCLUSION

On remand, the following issues should be addressed on the basis of the existing trial record:

1) whether Mirror Lite has shown by clear and convincing evidence that Rosco's '357 design patent is invalid under *35 U.S.C. § 103*;

2) whether Rosco has shown by preponderant evidence that Mirror Lite infringed (if valid) Rosco's '357 design patent;

3) whether Rosco has shown by clear and convincing evidence that Mirror Lite's '984 patent is invalid under *35 U.S.C. §§ 102(a)*, *102(f)*, and *103*, considering each claim separately;

4) whether Rosco has shown by clear and convincing evidence that Mirror Lite's '984 patent is unenforceable due to inequitable conduct;

5) whether Mirror Lite has shown by preponderant evidence that Rosco infringed any valid claim of its '984 patent (if those claims are valid and enforceable); and

6) whether Rosco has shown that Mirror Lite engaged in tortious interference with business relations through inequitable conduct in procuring the '984 patent.

COSTS

No costs.

[**28] *AFFIRMED-IN-PART.*
REVERSED-IN-PART. V.I.CITED-IN-PART, and
REMANDED.

LEXSEE 90 F.3D 1576

**VITRONICS CORPORATION, Plaintiff-Appellant, v. CONCEPTRONIC, INC.,
Defendant-Appellee.**

96-1058

UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

90 F.3d 1576; 1996 U.S. App. LEXIS 18587; 39 U.S.P.Q.2D (BNA) 1573

July 25, 1996, Decided

PRIOR HISTORY: [**1] Appealed from: U.S. District Court for the District of Hampshire Judge Loughlin.

constructed, the '502 *patent* may have been infringed, we reverse the trial court's decision and remand for further proceedings.

DISPOSITION: REVERSED AND REMANDED

BACKGROUND

The Patented Invention

COUNSEL: James J. Foster, Wolf, Greenfield & Sacks, P.C., of Boston, Massachusetts, argued for plaintiff-appellant. With him on the brief were Lawrence M. Green and Brett N. Dorny.

Vitronics and Conceptronic both manufacture ovens used in the production of printed. [*1579] circuit boards. The ovens are used to solder electrical devices (such as resistors, capacitors and integrated circuits) to the boards. Several methods of soldering devices to boards have been developed: the '502 *patent*, assigned to Vitronics, is directed to one of those methods.

Paul J. Hayes, Weingarten, Schurgin, Gagnebin & Hayes, of Boston, Massachusetts, argued for defendant-appellee. With him on the brief was Dean G. Bostock.

JUDGES: Before MICHEL and LOURIE, Circuit Judges, and FRIEDMAN, Senior Circuit Judge.

Specifically, the '502 *patent* is directed to a method for the reflow soldering of surface mounted devices to a printed circuit board in which the circuit board is moved by a conveyor through a multizone oven. In this process, a solder paste is placed on the circuit board and the devices to be soldered (with attached connectors) are placed on the paste. The circuit board is then placed on what is basically a conveyor belt running through an oven and passing through several different heating zones. In the final and hottest zone, the solder paste melts and forms a connection between the device and the circuit board. The boards remain in the last heating [**3] zone for only a short duration, allowing the solder to reach a temperature high enough to cause the solder to melt and reflow while maintaining the devices themselves below the solder reflow temperature. Due to this temperature differential, the solder flows up the device connectors to form a solid connection.

OPINION BY: MICHEL

OPINION

[*1578] MICHEL, *Circuit Judge*.

Vitronics Corporation ("Vitronics") appeals the September 27, 1995 order of the United States District Court for the District of New Hampshire, Civil Action No. 91-696-L, entering judgment as a matter of law that Vitronics did not prove that Conceptronic, Inc. ("Conceptronic") infringed claim 1 of *U.S. Patent No. 4,654,502* ("the '502 *patent*"). The appeal was submitted for decision after oral argument on May 8, 1996. Because we conclude that the specification of the '502 *patent* dictates a claim interpretation in accordance with the plaintiff's proposed construction, and [**2] that, so

Claim 1 of the '502 *patent*, the only claim at issue in

this appeal, reads as follows (with added emphasis on the disputed terms):

1. A method for reflow soldering of surface mounted devices to a printed circuit board comprising:

moving a printed circuit board having solder and devices disposed on a surface thereof through a first zone and in close proximity to a first emitting surface of at least one nonfocused infrared panel emitter, said first emitting surface being at a first panel temperature;

moving said board through a second zone and in close proximity to a second emitting surface of at least one nonfocused infrared panel emitter, said second emitting surface being at a second panel temperature lower than said first panel temperature; and

moving said board through a third zone and in close proximity to a third emitting surface of at least one nonfocused infrared [*4] panel emitter, said third emitting surface being at a third panel temperature higher than said second panel temperature, said third emitting surface heating said board and said solder to a solder reflow temperature for a period of time sufficient to cause said solder to reflow and solder said devices to said board while maintaining the temperature of said devices below said solder reflow temperature.

Proceedings Before the District Court

This action was brought on November 26, 1991 by Vitronics against Conceptronic for infringement of both the '502 patent and U.S. Patent No. 4,833,301 ("the '301 patent").¹ At the time the suit was filed, Conceptronic was selling the "Mark series" line of ovens. Conceptronic later discontinued the Mark series and began selling the "HVC series" line of ovens. Prior to trial, the parties

stipulated that every limitation of claim 1 of the '502 patent was met by the HVC series of ovens, except the limitation requiring the utilization of "nonfocused infrared panel emitters" and the limitation that the temperature of the devices must be maintained below the "solder reflow temperature."²

1 A jury returned a verdict of non-infringement of the '301 patent. Vitronics does not appeal that verdict.

[**5]

2 Whether the Conceptronic ovens utilize nonfocused infrared panel emitters is not before this court.

Vitronics, by way of a request for a jury instruction, asked the court to construe the meaning of the "solder reflow temperature" limitation. The specific instruction sought by Vitronics was as follows:

In considering the question of whether the '502 method patent has been infringed by the Mark and HVC Series ovens, you have to decide whether, in use, those ovens maintain the temperature of the devices below the solder reflow temperature. The phrase "solder reflow temperature" in the '502 patent means the temperature reached by the solder during the period it is reflowing during the final stages of the [*1580] soldering process, sometimes referred to as the "peak solder reflow temperature." It does not mean the "liquidus temperature," the temperature at which the solder first begins to melt. Thus, if the temperature of the devices stays below that of the solder, the '502 method patent is infringed by the Mark and HVC Series ovens.

Thus, Vitronics contended that, as used in the claim, [*6] solder reflow temperature means peak reflow temperature, i.e., a temperature approximately 20 degrees C above the liquidus temperature, at which the solder is completely melted and moves freely. Conceptronic, on the other hand, contended that solder reflow temperature means 183 degrees C, i.e., the liquidus temperature of a particular type of solder known as 63/37 (Sn/Pb) solder.³

3 The specification of the '502 patent describes

three exemplary types of solder which can be used in the solder reflow process -- 60/40 (Sn/Pb), 63/37 (Sn/Pb) and 62/36/2 (Sn/Pb/Ag) -- each of which, it indicates, has a liquidus temperature of about 190 degrees C and a peak reflow temperature of about 210 degrees to 218 degrees C. At trial, the parties appear to have discussed only 63/37 (Sn/Pb) solder, which has a liquidus temperature of 183 degrees C. However, the claims are not limited to that particular solder or a solder with that particular liquidus temperature.

The district court delayed construing the disputed language [**7] until the close of testimony, at which time it ruled in favor of Conceptronic and concluded that the term "solder reflow temperature" as used in claim 1 refers to 183 degrees C. Vitronics then conceded that the court was required to grant judgment as a matter of law in favor of Conceptronic, as Vitronics had not presented any evidence of infringement under the court's interpretation of solder reflow temperature. This appeal followed.

Claim Construction Aids Before the District Court

In spite of Vitronics' early request for a jury instruction on the proper claim construction, the district court delayed announcing its claim construction until hearing all the evidence put forth at trial. During trial, and in their briefs to the district court in support of their respective claim constructions, the parties discussed the patent specification, expert testimony, prior testimony and writings of Vitronics and its employees, and technical references. The most pertinent materials are discussed below.

The Patent Specification

Vitronics relied heavily upon the patent itself to support its asserted claim construction. Although Vitronics conceded that the term "solder reflow temperature" [**8] may be ambiguous when considered in isolation, it argued that the specification clearly shows that, as used in the claim, solder reflow temperature means peak reflow temperature rather than the liquidus temperature. In particular, Vitronics pointed to that part of the specification that describes a preferred embodiment:

A preferred embodiment of the invention for reflow soldering of surface mounted

devices to printed circuit boards will now be described. The printed circuit boards are typically made of epoxy-glass, such as fire retardant 4(FR-4), or polyamide glass. These boards typically degrade above temperatures of 225 degrees C. The solder may be, for example, 60/40 (Sn/Pb), 63/37 (Sn/Pb), or 62/36/2 (Sn/Pb/Ag). all of which have a liquidus temperature (i.e. begin to melt) of about 190 degrees C. and a peak reflow temperature of about 210 degrees -218 degrees C. Thus, to effect reflow soldering without damaging the board, the solder must be allowed to reach a temperature of at least 210 degrees C., but the board cannot reach a temperature of 225 degrees C.

...

The board is then sent into a fifth zone 5 to bring the temperature of the board up to a temperature of [**9] approximately 210 degrees C., the devices up to approximately 195 degrees C., and the solder up to approximately 210 degrees C. for a period of time of from about 10 to about 20 seconds to cause the solder to flow. Because the devices are cooler than the board, the solder flows up the devices. . . . The board spends approximately 60 seconds in the fifth zone, but only about 10 to 20 seconds at 210 degrees C. Thus, the board is at the solder reflow temperature for only a short period of time and the [**1581] devices never reach the solder reflow temperature.

Vitronics pointed out that, in the example described as the preferred embodiment, the temperature of the solder is raised to 210 degrees C, the peak reflow temperature, and the temperature of the devices is raised to 195 degrees C, 5 degrees above the 190 degrees C liquidus temperature. Thus, as argued by Vitronics, the term "solder reflow temperature" must be construed so that it refers to the peak reflow temperature because the claim requires that the temperature of the devices be maintained below "said solder reflow temperature"; if solder reflow temperature were construed to refer to liquidus temperature, the preferred embodiment [**10] would not

be covered by the patent claims.

Expert Testimony

Conceptronic relied heavily on the expert testimony of Dr. Rothe. Dr. Rothe testified that the meaning of the term "solder reflow temperature" in claim 1 is synonymous with liquidus temperature. Dr. Rothe further testified that the solder reflow temperature for 63/37 (Sn/Pb) is 183 degrees C. Dr. Rothe likewise testified at trial that several technical articles written by those skilled in the art supported his view that solder reflow temperature refers to liquidus temperature.

The Testimony of Mr. Hall

Conceptronic also relied on the testimony of Mr. Hall, the Chief Engineer at Vitronics. At trial, Mr. Hall confirmed that during his deposition he had testified that the reflow temperature of solder was 183 degrees C. Mr. Hall also testified that, during his deposition, he had used solder reflow temperature to refer to liquidus temperature. However, at another point in his trial testimony, Hall explained that, while in his earlier deposition testimony he had used solder reflow temperature to refer to liquidus temperature, he did not suggest that was how the term was used in the patent. Rather, Hall testified the [*11] patent uses the term to refer to the peak reflow temperature.

Paper Written By Former Vitronics Employee

Conceptronic also introduced into evidence a paper written by Phillip Zarrow, a former employee of Vitronics, defining solder reflow temperature in the following manner: "As the temperature of the solder paste on the interconnect passes the solder alloy's melting point and the solder enters a molten state, the assembly enters the reflow region of the process. For 63 Sn/37 Pb, a eutectic solder and the most common SMT alloy, reflow occurs at 183 degrees C." Phillip Zarrow, *Convection-Infrared and Convection Dominant Reflow Soldering of Fine Pitch SMT Devices*, § 10.3.3 (1994). However, that same paper later describes the solder reflow process as taking the temperature of the solder above liquidus: "Most solder manufacturers recommend bringing the interconnection temperature approximately 15 to 25 degrees C above the alloy melting point to achieve full liquidus and assure good solder flow and aid fillet formation." *id.*

*Memorandum of Plaintiff Vitronics Corporation in Opposition to Motion for Summary Judgment of Defendant Conceptronic Corporation and In Support of [**12] Plaintiff's Cross-Motion for Summary Judgment of Patent Validity and Infringement*

In its brief supporting its proposed construction of claim 1, both at the trial court level and here on appeal, Conceptronic similarly relied on a memorandum written by Vitronics which contains the following language: "Tin/lead solders commonly used by the electronic products industry have a 'liquidus' or 'reflow' temperature in the order of 183 degrees C, or about 361 degrees F." However, this phrase is in the background section of the memorandum and later in the same memorandum, Vitronics discussed the issue of infringement as being whether the temperature of the devices was maintained below "the temperatures of the leads at which the solder is reflowing."

Without indicating which evidence it relied upon, the district court simply ruled that solder reflow temperature meant 183 degrees C.

ANALYSIS

The Use of Intrinsic and Extrinsic Evidence in Claim Construction

A literal patent infringement analysis involves two steps: the proper construction [*1582] of the asserted claim and a determination as to whether the accused method or product infringes the asserted claim as properly construed. [*13] *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 976, 34 USPQ2d 1321, 1326 (Fed. Cir. 1995) (in banc), *aff'd*, U.S. , 116 S. Ct. 1384, 1393 (1996); *Hormone Research Found., Inc. v. Genentech, Inc.*, 904 F.2d 1558, 1562, 15 USPQ2d 1039, 1042 (Fed. Cir. 1990), *cert. dismissed*, 499 U.S. 955 (1991). The first step, claim construction, is a matter of law, which we review *de novo*. *Markman*, 52 F.3d at 979, 34 USPQ2d at 1329. Claim construction is the only step in the infringement analysis at issue in this appeal. ⁴

4 No assertion was made that defendant infringed under the doctrine of equivalents.

In determining the proper construction of a claim, the court has numerous sources that it may properly utilize for guidance. These sources have been detailed in our previous opinions, as discussed below, and include both

intrinsic evidence (e.g., the patent specification and file history) and extrinsic evidence (e.g., expert testimony).

It is well-settled that, in interpreting an asserted [*14] claim, the court should look first to the intrinsic evidence of record, i.e., the patent itself, including the claims, the specification and, if in evidence, the prosecution history. See *Markman*, 52 F.3d at 979, 34 USPQ2d at 1329. Such intrinsic evidence is the most significant source of the legally operative meaning of disputed claim language.

First, we look to the words of the claims themselves, both asserted and nonasserted, to define the scope of the patented invention. See *Bell Communications Research, Inc. v. Vitolink Communications Corp.*, 55 F.3d 615, 620, 34 USPQ2d 1816, 1819 (Fed. Cir. 1995). Although words in a claim are generally given their ordinary and customary meaning, a patentee may choose to be his own lexicographer and use terms in a manner other than their ordinary meaning, as long as the special definition of the term is clearly stated in the patent specification or file history. *Hoechst Celanese Corp. v. BP Chems. Ltd.*, 78 F.3d 1575, 1578, 38 USPQ2d 1126, 1129 (Fed. Cir. 1996) ("A technical term used in a patent document is interpreted as having the meaning that it would be given by persons experienced in the field of the invention, unless [*15] it is apparent from the patent and the prosecution history that the inventor used the term with a different meaning.") (citations omitted); *Hormone*, 904 F.2d at 1563, 15 USPQ2d at 1043 ("It is a well-established axiom in patent law that a patentee is free to be his or her own lexicographer and thus may use terms in a manner contrary to or inconsistent with one or more of their ordinary meanings.") (citations omitted).

Thus, second, it is always necessary to review the specification to determine whether the inventor has used any terms in a manner inconsistent with their ordinary meaning. The specification acts as a dictionary when it expressly defines terms used in the claims or when it defines terms by implication. *Markman*, 52 F.3d at 979, 34 USPQ2d at 1330. As we have repeatedly stated, "claims must be read in view of the specification, of which they are a part." *Id.* at 979, 34 USPQ2d at 1329. The specification contains a written description of the invention which must be clear and complete enough to enable those of ordinary skill in the art to make and use it. Thus, the specification is always highly relevant to the claim construction analysis. Usually, it is dispositive;

[*16] it is the single best guide to the meaning of a disputed term.

Third, the court may also consider the prosecution history of the patent, if in evidence. *Id.* at 980, 34 USPQ2d at 1330; *Graham v. John Deere*, 383 U.S. 1, 33, 148 USPQ 459, 473, 15 L. Ed. 2d 545, 86 S. Ct. 684 (1965). This history contains the complete record of all the proceedings before the Patent and Trademark Office, including any express representations made by the applicant regarding the scope of the claims. As such, the record before the Patent and Trademark Office is often of critical significance in determining the meaning of the claims. See *Markman*, 52 F.3d at 980, 34 USPQ2d at 1330; *Southwall* [*1583] *Tech., Inc. v. Cardinal IG Co.*, 54 F.3d 1570, 1576, 34 USPQ2d 1673, 1676 (Fed. Cir. 1995) ("The prosecution history limits the interpretation of claim terms so as to exclude any interpretation that was disclaimed during prosecution.") (citations omitted). Included within an analysis of the file history may be an examination of the prior art cited therein. *Autogiro Co. of America v. United States*, 181 Ct. Cl. 55, 384 F.2d 391, 399, 155 USPQ 697, 704 (Ct. Cl. 1967) ("In its broader use as source material, the prior art cited in the file wrapper gives [*17] clues as to what the claims do not cover.").

In most situations, an analysis of the intrinsic evidence alone will resolve any ambiguity in a disputed claim term. In such circumstances, it is improper to rely on extrinsic evidence. See, e.g., *Poll Corp. v. Micron Separations, Inc.*, 66 F.3d 1211, 1216, 36 USPQ2d 1225, 1228 (Fed. Cir. 1995) ("In construing the claims we look to the language of the claims, the specification, and the prosecution history. Extrinsic evidence may also be considered, if needed to assist in determining the meaning or scope of technical terms in the claims.") (citations omitted, emphasis added); *Hormone*, 904 F.2d at 1562, 15 USPQ2d at 1043 ("Claim interpretation involves a review of the specification, the prosecution history, the claims (including unasserted as well as asserted claims), and, if necessary, other extrinsic evidence, such as expert testimony.") (citations omitted, emphasis added). In those cases where the public record unambiguously describes the scope of the patented invention, reliance on any extrinsic evidence is improper. The claims, specification, and file history, rather than extrinsic evidence, constitute the public record [*18] of the patentee's claim, a record on which the public is entitled to rely. In other words, competitors are entitled to review the public record, apply

the established rules of claim construction, ascertain the scope of the patentee's claimed invention and, thus, design around the claimed invention. See *Markman*, 52 F.3d at 978-79, 34 USPQ2d at 1329. Allowing the public record to be altered or changed by extrinsic evidence introduced at trial, such as expert testimony, would make this right meaningless. See *Southwall*, 54 F.3d at 1578, 34 USPQ2d at 1678 ("A patentee may not proffer an interpretation for the purposes of litigation that would alter the indisputable public record consisting of the claims, the specification and the prosecution history, and treat the claims as a 'nose of wax.'" (quoting *Semmed, Inc. v. Richard-Allan Med. Indus., Inc.*, 888 F.2d 815, 819 n.8, 12 USPQ2d 1508, 1512 n.8 (Fed. Cir. 1989)). The same holds true whether it is the patentee or the alleged infringer who seeks to alter the scope of the claims.

The Proper Construction of the Claim Term "Solder Reflow Temperature"

As can be readily seen from those portions of the specification set [*19] forth above, the meaning of the disputed term "solder reflow temperature" in claim 1 of the '502 patent is clear from a reading of the claim itself and the patent specification. The "peak reflow temperature" and "liquidus temperature" are clearly defined in the specification as having distinctly different meanings. Specifically, for the solders described in the specification, liquidus temperature is about 190 degrees C and the peak reflow temperature is about 210 degrees C. Moreover, in the preferred embodiment described in the patent, the solder is heated to a temperature of 210 degrees C but the temperature of the devices is maintained at approximately 195 degrees C, i.e., below the peak reflow temperature (210 degrees C) but above the liquidus temperature (190 degrees C). Therefore, in order to be consistent with the specification and preferred embodiment described therein, claim 1 must be construed such that the term "solder reflow temperature" means the peak reflow temperature, rather than the liquidus temperature. Indeed, if "solder reflow temperature" were defined to mean liquidus temperature, a preferred (and indeed only) embodiment in the specification would [*20] not fall within the scope of the patent claim. Such an interpretation is rarely, if ever, correct and would require highly persuasive evidentiary support, which is wholly absent in this case. See *Modine Mfg. Co. v. United States Int'l Trade Comm'n.* 75 F.3d 1545, 1550, 37 USPQ2d 1609, 1612 (Fed. Cir. 1996); see also *Hoechst*, 78 F.3d at 1581, 38 USPQ2d at 1130 ("We

[*1584] share the district court's view that it is unlikely that an inventor would define the invention in a way that excluded the preferred embodiment, or that persons of skill in this field would read the specification in such a way.");

The District Court's Reliance on Extrinsic Evidence

Since the claim, read in light of the patent specification, clearly uses the term "solder reflow temperature" to mean the peak reflow temperature, rather than the liquidus temperature, that should have been the end of the trial court's analysis.⁵ Only if there were still some genuine ambiguity in the claims, after consideration of all available intrinsic evidence, should the trial court have resorted to extrinsic evidence, such as expert testimony, in order to construe claim 1. Moreover, even if the judge permissibly decided to hear [*21] all the possible evidence before construing the claim, the expert testimony, which was inconsistent with the specification and file history, should have been accorded no weight. *Southwall*, 54 F.3d at 1578, 34 USPQ2d at 1678; *Markman*, 52 F.3d at 983, 34 USPQ2d at 1333.

5 The file history was apparently not put into evidence.

Here, the trial judge considered not only the specification, but also expert testimony and other extrinsic evidence, such as the paper written by the former Vitronics employee. No doubt there will be instances in which intrinsic evidence is insufficient to enable the court to determine the meaning of the asserted claims, and in those instances, extrinsic evidence, such as that relied on by the district court, may also properly be relied on to understand the technology and to construe the claims. See *Markman*, 52 F.3d at 979, 34 USPQ2d at 1329. Extrinsic evidence is that evidence which is external to the patent and file history, such as expert testimony, inventor testimony, dictionaries, and [*22] technical treatises and articles.⁶ *Id.* at 980, 34 USPQ2d at 1330. However, as we have recently re-emphasized, extrinsic evidence in general, and expert testimony in particular, may be used only to help the court come to the proper understanding of the claims; it may not be used to vary or contradict the claim language. *Id.* at 981, 34 USPQ2d at 1331. Nor may it contradict the import of other parts of the specification. Indeed, where the patent documents are unambiguous, expert testimony regarding the meaning of a claim is entitled to no weight. *Southwall*, 54 F.3d at 1578, 34 USPQ2d at 1678. "Any

other rule would be unfair to competitors who must be able to rely on the patent documents themselves, without consideration of expert opinion that then does not even exist, in ascertaining the scope of a patentee's right to exclude." *Id.* at 1578, 34 USPQ2d at 1678-79. Nor may the inventor's subjective intent as to claim scope, when unexpressed in the patent documents, have any effect. Such testimony cannot guide the court to a proper interpretation when the patent documents themselves do so clearly.

6 Although technical treatises and dictionaries fall within the category of extrinsic evidence, as they do not form a part of an integrated patent document, they are worthy of special note. Judges are free to consult such resources at any time in order to better understand the underlying technology and may also rely on dictionary definitions when construing claim terms, so long as the dictionary definition does not contradict any definition found in or ascertained by a reading of the patent documents.

[**23] In addition, a court in its discretion may admit and rely on prior art proffered by one of the parties, whether or not cited in the specification or the file history. This prior art can often help to demonstrate how a disputed term is used by those skilled in the art. Such art may make it unnecessary to rely on expert testimony and may save much trial time. As compared to expert testimony, which often only indicates what a particular expert believes a term means, prior art references may also be more indicative of what all those skilled in the art generally believe a certain term means. Once again, however, reliance on such evidence is unnecessary, and indeed improper, when the disputed terms can be understood from a careful reading of the public record. See *Kearns v. Chrysler Corp.*, 32 F.3d 1541, 1547, 31 USPQ2d 1746, 1750 (Fed. Cir. 1994). Nor may it be used to vary claim terms from how [*1585] they are defined, even implicitly, in the specification or file history.

Unfortunately, here the trial judge did use the extrinsic evidence to vary or contradict the manifest meaning of the claims. The trial judge was presented with expert testimony and other evidence that some of those skilled [*24] in the relevant art, including certain Vitronics employees, sometimes used the term "solder reflow temperature" and "liquidus temperature" interchangeably. He apparently relied on this testimony in

reaching his conclusion that, as used in claim 1, solder reflow temperature meant 183 degrees C. ⁷ However, regardless of how those skilled in the art would interpret a term in other situations, where those of ordinary skill, on a reading of the patent documents, would conclude that the documents preclude the term being given the meaning propounded by the expert witnesses, we must give it the meaning indicated by the patentee in the patent claim, specification and file history. Thus, expert testimony tending to show that those skilled in the art would, in certain circumstances, understand "solder reflow temperature" to mean the solder liquidus temperature is entitled to no weight in light of the clear contrary meaning shown in the specification. See *Southwall*, 54 F.3d at 1578, 34 USPQ2d at 1678 ("Even if Southwall could show that 'sputter-deposited dielectric' has a meaning to one skilled in the art different from the definition in the '745 specification and file history, the definition [*25] in the patent documents controls the claim interpretation."). Because the specification clearly and unambiguously defined the disputed term in the claim, reliance on this extrinsic evidence was unnecessary and, hence, legally incorrect.

7 Although the trial judge's reasoning does not appear in the record, he must have relied on the testimony presented by Conceptronic that "solder reflow temperature" and "liquidus temperature" were synonymous and the undisputed testimony that the liquidus temperature of 63/37 (Sn/Pb) solder is 183 degrees C.

Had the district court relied on the expert testimony and other extrinsic evidence solely to help it understand the underlying technology, we could not say the district court was in error. But testimony on the technology is far different from other expert testimony, whether it be of an attorney, a technical expert, or the inventor, on the proper construction of a disputed claim term, relied on by the district court in this case. The latter kind of testimony may only be relied [*26] upon if the patent documents, taken as a whole, are insufficient to enable the court to construe disputed claim terms. Such instances will rarely, if ever, occur. Indeed, this case did not present such an instance. Even in those rare instances, prior art documents and dictionaries, although to a lesser extent, are more objective and reliable guides. Unlike expert testimony, these sources are accessible to the public in advance of litigation. They are to be preferred over opinion testimony, whether by an attorney or artisan in

the field of technology to which the patent is directed. Indeed, opinion testimony on claim construction should be treated with the utmost caution, for it is no better than opinion testimony on the meaning of statutory terms. See *Markman*, 52 F.3d at 983, 34 USPQ2d at 1332-33 ("First, the testimony of Markman and his patent attorney on the proper construction of the claims is entitled to no deference. . . . This testimony about construction, however, amounts to no more than legal opinion -- it is precisely the process of construction that the court must undertake.").

Other Issues

Conceptronic further argues that, even if we were to reverse the district [**27] court's decision regarding the proper interpretation of the term "solder reflow temperature," the district court's ultimate conclusion of no infringement as a matter of law can still be affirmed on the alternative ground that Vitronics' evidence does not prove infringement because Vitronics failed to test the temperature of all of the various devices on the boards and because certain of the Vitronics tests demonstrated

that many of the devices reached temperatures above the peak reflow temperature. Vitronics, of course, disputes these assertions and points to supporting documentation to the effect that the Conceptronic [*1586] ovens do indeed maintain the temperature of the devices below peak reflow temperature. The trial court made no decision on this issue. Moreover, such a determination at this stage would require our weighing substantial but conflicting evidence, an impermissible exercise for an appellate court. Accordingly, we must remand.

CONCLUSION

For all the foregoing reasons, the judgment of non-infringement as a matter of law is reversed and the case is remanded for further proceedings consistent with this opinion.

REVERSED AND REMANDED

COSTS

Costs in favor of Vitronics. [**28]

RELATED PROCEEDINGS APPENDIX

None.